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Far Transmission

FORERUNNER IN SWEDEN OF 400 kV SYSTEMS

MANY countries have reached a stage in electrical development at which the more economically exploited primary power sources near load centres threaten to become inadequate for meeting growing demands. Voltages of from 110 kV to 220 kV now in use will often not be high enough to transmit current from possibly richer resources in more remote areas without unduly large transmission losses and, usually more serious, risk of system instability. In many instances, also, the obstacles offered by the routes to the construction and maintenance of overhead lines entail the use of the lowest number of circuits. Consequently intensive research is being carried out on the Continent of Europe and in the United States into the problems associated with a.c. transmission at 400 kV—the most troublesome of which are due to corona and interference with wireless communications.

Six Hundred Miles

So far only one large commercial scheme has been actually put in hand for this voltage. That is the 600-mile system in Sweden, which is expected to be in operation in about two years from now, the immediacy of the need ruling out the feasibility of employing direct current. Particulars of this enterprise have been given from time to time, notably by W. Borgquist, and the most recent information is presented in the publication of the State Board which is reviewed in this issue.

Conditions there typify the general trend in that the hydro-electric potentialities of the populous southern third of the country having been used, the greater resources around Midskog, 300 miles north of Stockholm, were then called into play. The bold decision to harness the Harspranget falls, a further 300 miles away, and to build further stations in the Midskog area, will enable the remaining two-thirds of the Swedish water-power potentialities to be utilized.

Improvement of Stability

To extend the existing 220 kV system would have entailed ultimately the construction of twenty-four lines instead of the six required at 380 kV and annual charges would have been about twice as great. Stability will be assisted by the bus-bar system at Midskog and by the relief afforded by the 220 kV lines which, like former primary lines elsewhere, retain their value as high-voltage distributors. By the adoption of "bundled" conductors, even though the number per phase is restricted to two, as the simplest and most economical arrangement, stability (through reduced reactance) as well as corona conditions should be considerably improved.

The Swedish scheme is, no doubt, the forerunner of a number of others elsewhere at 400 kV which entail long transmission distances. In addition to expenditure on lines and substations, higher costs are to be expected in building power stations in out-of-the-way places. It seems probable, too, that in most instances both lines and stations will be

underloaded in the early stages. These general considerations to some extent affect coal-fired stations also, as these tend to approximate to hydro-electric siting conditions in their dependence on large supplies of cold water, which become increasingly less plentiful in industrial districts.

Any likely advance in the cost of electricity in the years to come will, however, be insignificant in relation to the fundamental fact that its abundance is essential to any industrial nation. An effective way of counteracting higher standing charges of electricity production is to raise the load factor of utilization.

YORK EXPLOSION

POWER house boiler explosions are such rare occurrences in this country that first reports of the mishap at York last week were hardly credible. The official statement, to be found on another page, shows that failure of one of the three mud drums of a 200 lb/sq in steam boiler that has given trouble-free service for twenty years resulted in severe damage being done to electrical plant and the fabric of the buildings by the severity of the explosion. This occurred in the early hours of the morning, otherwise there might have been regrettable loss of life. As it is, one of the eight men on duty is unaccounted for. Fuller investigations must await the clearance of wreckage, which is still proceeding.

SIMPLIFIED PRODUCTION

IT may be regarded as axiomatic that concentration upon a few standard lines is more conducive to high production and low cost than the spreading of effort over a multiplicity of designs. British manufacturers are aware of this but for various reasons have not pursued simplification so far as their American counterparts. One potent reason is the individuality of the British buyer which makes him more difficult to persuade than the American customer; another is the endeavour of the British manufacturer to meet the varied requirements of his many overseas markets. Whether, and to what extent, these conditions can be altered is not easily discovered but it is desirable that attempts should be made to simplify, and thus cheapen, productive methods. The party which recently visited the United States under the auspices of the Anglo-American Council on Productivity, whose report is referred to in this issue, recommends means by which this may be accomplished. It also suggests that the trade and technical Press can do much to assist by publicizing facts and "case histories." To do this it must have the full co-operation of the producers.

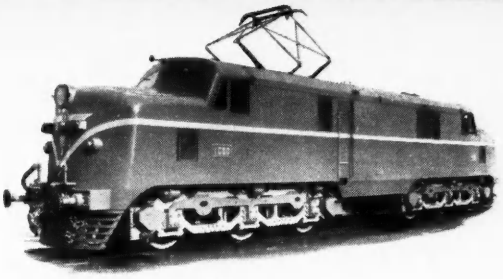
URBAN LOADS

TWO of the many points made by Mr. J. W. Leach in his chairman's address to the I.E.E. Supply Section (reported on page 850) related to the most densely loaded spots in London or, indeed, in any large town. The first was that, in estimating future demands, the possibility of saturation can be ignored for any foreseeable time. The other was that the best means of meeting peaks in certain areas might be by gas turbines built for low capital cost and space factor rather than for high thermal efficiency. An important feature of these units is that they can be designed for either purpose, depending on the number of components incorporated.

RURAL SETBACK

AMPLIFYING the Prime Minister's original statement, Sir Stafford Cripps last week said that the cut to be made in capital expenditure in the electricity supply industry would fall mainly into the sphere of distribution. He did not say that there would be no interference with the provision of badly needed generating capacity. Rural development seems to be the direction in which economy is to be exercised, but in pursuing this course the Government goes against one of the primary considerations which led to the setting up of the Electricity Boards. Among the Boards' functions is (Electricity Act, 1947, Section 1 (6) (*b*)) to "secure, so far as practicable, the development, extension to rural areas and cheapening of supplies of electricity." If it is a mistake to interfere with the provision of adequate power for industry it is equally wrong to debar the food-producing community from a service recognized to be essential to further progress.

Locomotives for Brazil



Electrical Equipment of the Largest Type Yet Produced in this Country

A FEW days ago, we had an opportunity of visiting the works of the Vulcan Foundry, Ltd., at Newton-le-Willows, Lancashire, and inspecting a 3,000 h.p. 3,000 V d.c. mixed traffic electric locomotive which is the first of fifteen to be completed as part of a Brazilian railway electrification scheme. The contract for this work was signed in London in September, 1946, between the Sao Paulo Railway Co., and the English Electric Export and Trading Co., and apart from the locomotives it provided for three 3-car suburban trains and the electrification of the section of track between Mooca and Jundiai in Brazil. Subsequently, the railway was taken over by the Brazilian Government and it is now known as the Estrada de Ferro Santos a Jundiai (E.F.S.J.).

The length of main line to be electrified comprises about 64km of 5ft 3in gauge double track and includes sections with gradients up to 2.5 per cent. It adjoins the already electrified Paulista Railway at Jundiai, thus forming a continuation of the 3,000 V system as far as Sao Paulo and the nearby station of Mooca, where extensive freight yards are also being electrified.

This section forms the main railway route to the port of Santos so it has a high traffic density, freight composing about 65 per cent of the total. Furthermore, it is anticipated that the increased speed and availability of the electric stock will raise the traffic density by 40 per cent over that in 1946, to about 21,000 trailing tons per day.

The economic advantages of the scheme

Main assembly shop showing electric and diesel-electric locomotives in course of construction

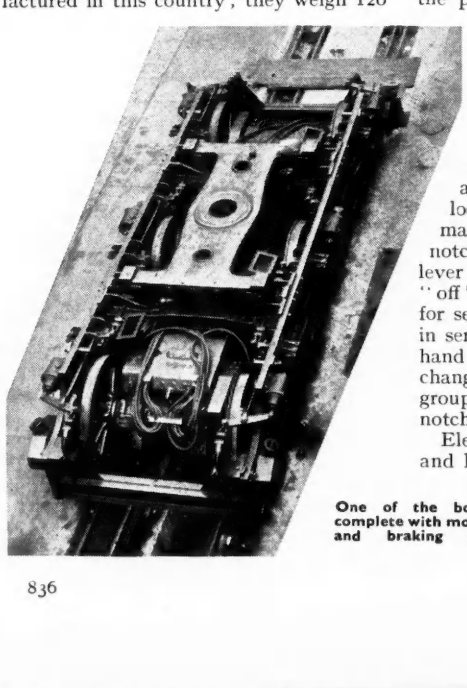
are of great importance to Brazil in view of the high cost of imported coal for steam locomotives as compared with the cheaply generated hydro-electric power which is readily available. Power for the system is obtained from the hydro-electric station of the Sao Paulo Light and Power Co., at 88kV and fed by overhead lines to the main substation at Tiete where it is stepped down to 33 kV. From this point two other substations at Caieiras and Campo Limpo are remotely controlled together with four track sectioning cabins. Each substation has an installed capacity of 4,000 kW, with space available for a further 2,000 kW, and uses pumpless steel bulb rectifiers. The substation and track buildings are nearing completion and most of the equipment has been shipped and is in course of erection.

The 3,000 V d.c. overhead distribution line and the 33 kV transmission lines connecting the substations have been supplied and are now being erected by British Insulated Callender's Cables, Ltd. The work is well advanced and it is anticipated that the system will be put into operation early next year.

The locomotives are the largest and most powerful of their type so far manufactured in this country; they weigh 120 tons and are 10ft 1in wide and 67ft 3in over buffers. The electrical equipment is being made by the English Electric Co., Ltd., and the mechanical parts by the Vulcan Foundry, Ltd., at whose works the final assembly is being carried out.

The superstructure is streamlined with a cab at each end mounted at the rear of each nose-end compartment, thus setting a new standard for main-line electric locomotives. Within the superstructure, between the cabs, the equipment is symmetrically mounted, commencing with a large output motor-generator blower set at each end, followed by four cubicles containing the line breakers, resistances, contactors, relays, etc., mounted in pairs behind each motor-generator set, with the main starting resistances on two separate frameworks in the centre.

Power is picked up by one of two double-span pantographs, which can operate from 17ft 6in to 22ft above rail level, and is subsequently controlled by the h.v. switchgear mounted in separate compartments in the centre section of the locomotive. These compartments have interlocked doors, which can be opened only by the removable reverser key of the master controller. Immediately this is done an air valve is operated, lowering the pantograph and providing full protection to personnel.



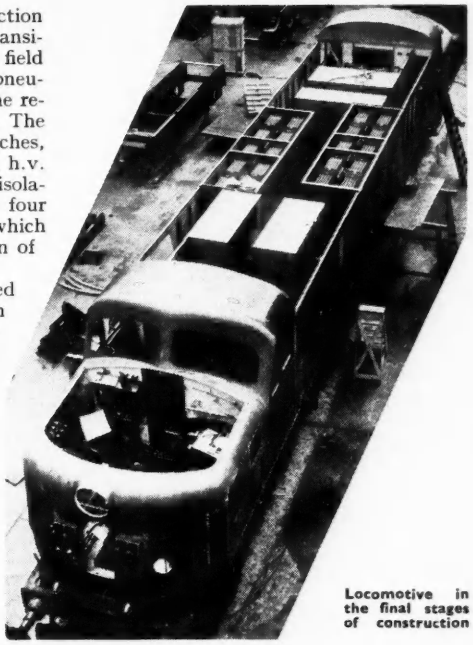
One of the bogies complete with motors and braking gear

Control over the locomotive for both motoring and regenerating is centred in the master controller situated in each cab. This is furnished with a main handwheel and three levers which are mechanically interlocked with one another, the former governing the locomotive speed, which reaches a maximum of 110 km.p.h. A total of 35 notches is provided. The reversing lever has three positions, "reverse," "off" and "forward" and it is also used for selecting the field weakening notches in series and series-parallel. The second hand lever operates the power-brake changeover switch and selects the motor grouping during regenerative braking, 18 notches being provided in all.

Electro-pneumatic unit type contactors and line breakers are fitted. The latter are arranged for high-speed operation in conjunction with overload relays. Electro-magnetic contactors are used

for the auxiliary circuits. The selection of the three motor groupings, the transition from motoring to braking and field control are carried out by electro- pneumatic cam type group switches. The reversers are of the same general type. The contactors, line breakers, group switches, reversers, overload and other relays, h.v. auxiliary fuses, main and auxiliary isolators are grouped conveniently on four frames of angle-iron construction, which are totally enclosed for the exclusion of dust where necessary.

Three traction motors are arranged to drive each of the two bogies, each motor driving one axle. They are of the series-wound force-ventilated axle-hung nose-suspended type, driving through solid spur gearwheels and pinions. The armatures are lap-wound and the shafts are fitted with roller bearings. Four brush arms are provided and the commutator is of the wedge bound pattern. Class B insulation is used throughout for 3,000 V to earth. The suspension bearings are of the sleeve type with removable axle caps and an earth return carbon brush bearing on the driving axles is also fitted. Each motor is rated at 500 h.p. for one hour and 400 h.p. continuously.



Locomotive in the final stages of construction

Three motor groupings are provided: series, series-parallel and parallel, two motors being connected in permanent series throughout. This arrangement makes possible a total of nine running notches. Sixteen accelerating notches are provided in series, ten in series-paralled and seven in parallel. Switches are fitted so that three traction motors can be cut out in the event of a motor failure.

Regenerative braking is provided by four traction motors using two groupings; series and parallel. The series fields of these four machines are separately excited from the fifth motor, while the sixth runs idle. The field of the fifth machine is in turn excited from a small variable-voltage regenerative exciter. This arrangement gives a resultant excitation to the traction motors, which is proportional to speed and the scheme embodies the well-known stabilizing resistance method of control.

The auxiliary equipment is most comprehensive. Two large motor-generator blower sets are fitted, each generator having a continuous output of 20 kW at 110 V and the motor end being designed for 3,000 V d.c. operation. Overhung from each of these is a traction motor blower supplying three motors apiece. These machines supply all the auxiliary load, including the lighting of the locomotive. The l.v. side of each set is controlled by a carbon-pile regulator and the motor has a specially designed field system to ensure good commutation under all conditions of starting, load and line voltage surges.

Each exhauster has a displacement of 88 cu ft/min and the air compressors a displacement of 77 cu ft/min. The regenerative exciter is a motor-generator set receiving its supply at 110 V and having an output of 2 kW. There is also an alkaline battery consisting of 72 cells with a capacity of 40 Ah at the five-hour rate of discharge and mounted in each driver's cab is a 1 kW breakfast cooker.

Both air and vacuum operated braking equipment is fitted, because of the transition from the vacuum to air brake sys-

tem which is at present taking place on the railway. The standard 14-EL air brake equipment is used. The air, vacuum and regenerative brakes are interlocked in such a way that, in the event of an emergency application during regeneration, the latter is automatically cut out. Hand brakes can be operated from a wheel in each cab.

Caieiras substation, one of two which provide power for the Mooca-Jundiai section and are remotely controlled from the main substation at Tiete

Owing to the general conditions prevailing on the railway, which involve short hauls, and considering the complexity of handling very large trains in the shunting yards, the maximum mechanical size of freight trains will be limited to 600 tons. A single locomotive is capable of hauling a load of this weight on the level at the maximum permissible speed of 45 m.p.h. and on a gradient of 2.5 per cent at about 20 m.p.h. Using regenerative braking it can also be hauled down the same gradient at the same speed.

Passenger trains, on the other hand, will be hauled with loads varying from 300 tons to 700 tons. The largest are the through trains from the Paulista Railway which will require double heading. Express trains of 500 tons can be hauled on the level at 60 m.p.h. and up 2.5 per cent gradients at 35 m.p.h. The locomotives are designed for multiple unit operation to permit of dealing with the heavier trains which are anticipated in the future as traffic on the system grows.

Economics of Sound Broadcasting

IN his inaugural address at the Institute of Electrical Engineers recently, Mr. R. T. B. Wynn (B.B.C.), chairman of the Radio Section, gave an account of how the economic and manpower limitations of the present time are being faced and outlined some of the economies which can be made in the planning, design and operation of a sound broadcasting system.

He began by discussing the general arrangement and elementary requirements of a broadcasting system, describing the various types of equipment in current use and that which is in process of development to reduce the number of operatives and increase the efficiency of working. He dealt with studio centre equipment, passing on to monitoring with special reference to the automatic equipment which has more recently come into use.

Mr. Wynn then discussed the initial capital and subsequent running costs of high power transmitting stations, giving careful consideration to the component items making up these totals. After treating low-power transmitting stations in similar fashion, he dealt with unattended stations of various types.

Essentially, Mr. Wynn's address consisted of a review of present practice and future planning. He felt that new capital expenditure must be made cautiously; post-war conditions demanded that economy in manpower should be a paramount consideration if running costs were to be kept down.

Supervising Engineers

IN our report of the presidential address to the Association of Supervising Electrical Engineers last week we inadvertently referred to Mr. A. G. Ramsey as being connected with the Ministry of Supply. He is, of course, chief engineer to the Ministry of Works.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Compulsory Registration

I HAVE noted with interest the claim made by the A.S.E.E. in regard to compulsory registration of contractors, your note of a fortnight ago and Mr. Brammer's reply, and would like to point out to Mr. Brammer that compulsory registration was very much in the public eye, so far as electrical men were concerned, in 1928 and for a few years afterwards.

I wrote a long article in 1928, followed by many others, and there were dozens of contributions to the Press, many with photographs, from people all over the country dealing with wiring atrocities and the need for registration.

In April, 1929, you reported a meeting of the National Register of Electrical Installation Contractors, when it was stated that 15,000 reprints of a certain article on "The Need for Compulsory Registration" had been distributed to architects and that application had been made for 100,000 leaflets entitled "Hidden Risks" by contractors or other interested parties.

This should convince Mr. Brammer that the claim that compulsory registration was brought into the open in 1936 was not, as you say, well founded. I do not think for one moment that Mr. Brammer intended to mislead, but he must have been not too well informed.

HARRY MOSS,
Bradford. M.I.E.E., F.I.E.S.

Contractors as Advisers

THE letter from Mr. J. Mortimer Hawkins, in your issue of 14th October, contains the opinion that "the consumer should be encouraged to regard his contractor as his agent and interpreter in electro-technical matters."

About a year ago, my house was wired by a contractor, the installation including a water immersion heater. When first switched on, the heater blew the fuse and proved to have been wrongly connected. Recently, after six months' use (summer load only), the heater burnt out. It is an unbranded article and is not guaranteed, although it cost nearly £10. The contractor apparently regards "that as that."

Now I think that, in general, the consumer is only too ready to have confidence in the contractor, even when the consumer is an electrical engineer himself and has his private misgivings about the contractor's technical methods. But is the confidence justified?

"DOUBTFUL."

Technical Education Problem

IN your 21st October issue "Ab Initio" may have created a wrong impression regarding the facilities available for the so-called "neglected 30's."

There is an alternative to the five years "hard" mentioned by him and that is to take an intensive course for the Higher National Certificate over a period of about nine months; this course also covers the necessary "endorsement" subjects. The conditions of entry are (a) the possession of an Ordinary National Certificate and (b) service in H.M. Forces or its equivalent. Grants can be obtained by the students to cover expenses and maintenance.

Most men in the 30's engaged in engineering should be in possession of an O.N.C. obtained before 1939 and should not therefore have to plod through first-year subjects. Those men who have not an O.N.C. must have wasted valuable years during the early part of their career and consequently cannot now expect to short-circuit the standard procedure. In any case the suggested concentrated course starting at 53/A1 standards for one winter session could hardly be beneficial to anyone without an O.N.C. or equivalent knowledge.

I cannot agree that "the H.N.C. is of little use to anyone over 30 years of age." If anyone is endeavouring to obtain membership of an engineering institution the possession of the H.N.C. carries valuable

exemptions from the examinations. The value of membership of an engineering institution lies in the fact that hard work is required to obtain it. By altering the rules to make it comparatively easy, as is apparently suggested, its value would be reduced, in which case the incentive to possess the qualification would no doubt be removed.

I am sure that education officials will generally be in agreement with my point of view.

"CEBARUGH"

AFTER reading "Ab Initio's" letter one wonders why did he not look after his technical education between the ages of 16 to 21 years as the majority of engineers do.

The Institution's standards cannot be lowered merely to allow individuals to obtain letters to place after their names. "Ab Initio" states that there are many engineers who, although they do not possess technical qualifications, have a knowledge equal to Higher National Certificate standard, but if these people were to take the course leading to the H.N.C. they would, without doubt, find that their knowledge was greatly below this standard, especially with regard to advanced mathematics which plays such a large part in the theory of electrical engineering. And if some of these engineers were asked to prepare an instructional paper on a.c. and d.c. theory up to third year or Ordinary National Certificate standard without the aid of a textbook they would soon realize their limitations.

I would suggest that these over 30's, who believe they are blessed with a knowledge of high standard without having followed an organized course of study, should obtain entrance to their chosen Institution by submitting a thesis. This would cut out the five years' or more of "graft" that they feel is too much for them.

"HIGHER NATIONAL."

YOUR correspondent "Ab Initio" states the case of the "neglected 30's" very clearly but does not appear to have heard of the A.S.E.E. Swann Diploma Examination. This scheme, operated by the Association of Supervising Electrical Engineers, caters particularly for those in the supervisory grades who have passed through their electrical training long ago, to provide a qualification indicating their competence in installation and maintenance responsibilities and the experience they have gained.

The standard of the examination is high; passes in the H.N.C., City and Guilds Final and A.M.I.E.E., or equivalent examinations are accepted as exempting qualifications from Part 1. The methods adopted for the examination should awaken fresh desire in your correspondent's "neglected 30's." The question papers for Part 1(A), the written part of the examination, are sent to the candidate who answers them in his own home, with the free use of textbooks and time, after he has studied his subjects anew in any way he wishes.

He later attends at a suitable centre where he meets the examiner and two supervising engineer advisers from the candidate's own sphere of industry, and the oral part of the examination takes place. In this, skilful questioning determines whether or not the written paper is a good criterion of the candidate's knowledge and this is followed up with questions further to test his ability to grasp the essence of practical problems, his methods of approach and his technical qualifications generally and specifically.

While the Swann Diploma examination is becoming widely recognized by employers as a desirable distinction for supervising engineers, it is not accepted at present as an exempting qualification for other institutional examinations, but there is no doubt that it fills a great need for the "neglected 30's," and would give them the basis and confidence to enter for the Institution examinations later if desired.

G. DAVIDSON, M.I.E.E.

London, N.3.

VALUABLE space in your columns could have been saved had your correspondents on this subject merely asked, "Why not facilitate the admission of those in their late twenties and early thirties to corporate membership of engineering institutions?"

To justify this plea, your correspondents suggest that the unhappy position in which they are placed is due solely to the absence of suitable training facilities since 1939, and that their particular age

groups have suffered most in this respect. Surely they forget that students attending technical colleges and universities at the outbreak of, and during, the war received special consideration, postponement of military service being automatic for those who were within two years of taking certain recognized examinations at the time of registration, whilst immediately on cessation of hostilities special educational facilities coupled with financial aid were provided for those whose studies had been interrupted.

In the circumstances, it would appear that the requirements of the age groups specified were fully realised and that your correspondents have only themselves to blame for neglecting their opportunities in earlier years. They should bear in mind also that by advocating specialist courses they strike at the foundations of technical engineering education, the aim of which is to produce engineers possessing a broad, if somewhat elementary, knowledge of their chosen vocation. Specialization comes later and is the concern of the individual.

The reason for my challenging your contributors' views is that I, too, am an ex-serviceman, aged 29, with domestic commitments and I consider my "piece of paper" a valued possession. G. K.

REFERRING to the letter from "Ex-Service," I also took my H.N.C. last June and only received official notification of my result on 28th October. I had, however, visited the I.E.E. late in August and they were able to give me the results. I suggest therefore, that the fault may lie possibly with the technical college at which the examination was taken.

With reference to the A.M.I.E.E. qualifications, what is the good of making the requirements easy? There are too many cheap "letters" about already.

Guildford. E. O. MULLER.

Gifts to E.I.B.A. Home

FRIENDS of the Electrical Industries Benevolent Association will be glad to hear that the Association has received the following further gifts to help make the home for old people at Broome Park, Betchworth, Surrey, still more comfortable and attractive: Six electric fires, Belling & Co., Ltd.; electric floor polisher and vacuum cleaner, R. G. Dixon & Co., Ltd.; binoculars, R. Gibbons & Co.; draughts and chess sets, Metropolitan-Vickers Electrical Co., Ltd.; "Mah Jong" set, G. S. Peckham & Co., Ltd.; and a set of bowls, Mrs. L. C. Sharp.

H. SENIOR FOTHERGILL,
Secretary, E.I.B.A.

32, Old Burlington Street, W.1.

Ships' Auxiliaries

IN the course of his presidential address to the Institute of Marine Engineers in London, Lord Rotherwick (chairman of several marine and engineering concerns) remarked that the present tendency to increase the speed of ships' auxiliary machinery might not be objected to when it was turbine driven. He did feel that some reliability might be lost when high-speed reciprocating engines were employed for this purpose.

The tendency to use electrically operated auxiliaries was right, from the points of view of both reliability and lower operating costs, the latter particularly when vessels were in port. In pre-war days it was customary for a cargo liner to spend about two-thirds of the year at sea and a third in port, whereas now almost the reverse was the case. For that reason economical operation of machinery in port had become more important, and although the first cost of electrical auxiliaries was considerably greater than that of steam equivalents, the fuel cost of operating electrical auxiliaries showed a considerable economy, taken over the life of a vessel, and this item was particularly noticeable in port.

Review of Welding

IN his presidential address before the Institute of Welding at the Institution of Structional Engineers in London last week, Mr. O. V. S. Bulleid enumerated a number of examples with particular reference to railway engineering, which clearly indicated the progress in the application of welding and the growth of specialized techniques. Mr. Bulleid said that this advance had been helped by members of the Institute by disseminating a knowledge of work done and breaking down the fear of changes in practice.

Welding was a valuable tool especially as the value of saving weight was now appreciated and, therefore, the training of men should be further developed to promote progress. The Institute had cause to be proud of its work.

Views on the News

By REFLECTOR

THE police sergeant in "The Pirates of Penzance" observed that a policeman's lot was not a happy one. After listening to Mr. A. Young, Assistant Commissioner, at last week's luncheon of the Batti-Wallahs' Society, I gather that the policeman's lot has much improved with the introduction of modern methods of communication, and that it is the lawbreaker who now finds life difficult. Mr. Young described the organization of the communications branch of the police force and some methods, particularly the use of radio telephony, which enabled the police to speedily reach the scene of the crime, and often catch the culprit in the act. Following his talk, Mr. Young showed a film in which the use of radio telephony and the area car system results in the capture of a shop burglar.

★ ★ ★

Medical men are much harassed nowadays by the avalanche of forms with which they are called upon to deal. Certificates are needed by their patients for all sorts of "priorities" but I am puzzled by the statement of a doctor in the *Manchester Guardian* that these include electric immersion heaters and electric cookers. I thought that immersion heaters, at least, were no longer in "short supply" and there seem to be sufficient cookers about.

★ ★ ★

Doubts as to the suitability of the domestic type of washing machine for use in communal laundries are raised by Mr. R. D. Bland in an article in the *Architect and Building News*. The usual type of domestic washing machine is claimed to wash 9lb in 30 minutes, but this is said to be insufficient time for normally soiled articles; even with the best of commercial machines approximately one hour is required for the complete washing cycle. As the average weekly wash is about 30lb the housewife would have to use a domestic machine for at least three hours a week. At the customary charge of 1s an hour, a total of 3s a week is more than the average tenant of a flat can afford. Furthermore, as the domestic machine does not usually boil, the clothes may not be sterile after washing. Used for not less than forty hours a week, it is unlikely that a machine would have a life of more than one to two years. Mr. Bland advocates the use of 5½ cu ft individually driven machines which, with the aid of hydro-extractors, would enable a housewife to wash and have ready for ironing a full 30lb dry weight of clothes in 1 hour 10 minutes. There may be something in Mr. Bland's views but from the time, not the cost, aspect, I should say.

★ ★ ★

It was not very nice of the *Electrical Review's* sprightly little contemporary the *Gridiron* (magazine of the Merseyside and North Wales Division, B.E.A.) to say in its November issue: "Not all the people in the stations have an opportunity to see the technical journals, and if they do, it is not always possible to find time to sift the wheat from the chaff." I think that practically everything in most of these journals is grist for somebody's mill. What is aimed at is to give a general picture of the industry served so that those in particular branches may learn what those in other sections are doing and thus give them that wider view which is so desirable.

★ ★ ★

Among the latest discoveries of the *Daily Express* is the electronic cooker. One of its reporters found one in use in a liner in which, it is said, a chef pressed a button and cooked a choice steak in 15 seconds. The chef is credited with the statement that: "This has revolutionized cooking. You just electrocute the food. How does it work? I don't know. I think it has got something to do with radar"—or television, I suggest.

★ ★ ★

It was recently announced in the Northern Ireland House of Commons that the Government was "investigating all forms of electricity from cold water to hot air." I suppose there was never a time when the possibilities of exploiting the latter medium were so promising.

Personal and Social

NEWS OF MEN AND WOMEN OF THE INDUSTRY

At the annual meeting of the British Valve Manufacturers' Association held on 18th October, **Mr. E. B. Ball** (Glenfield & Kennedy, Ltd.), and **Mr. J. M. Storey** (Dewrance & Co., Ltd.), were re-elected chairman and vice-chairman respectively.

Mr. C. W. Brown, M.I.E.E., engineer in charge of telephone exchange design in the Post Office, retired on 31st October, after forty-five years' service. He was closely associated with the first public automatic telephone exchange opened at Epsom in 1912, and soon became one of the few experts on the technique of automatic telephony. With the extension of automatic working in this country, Mr. Brown was entrusted with the charge of organizing a training school for telephone engineers and under his guidance the school grew until all phases of the telecommunications art were covered and thousands of students passed through the school annually. During the post-war years he has represented this country on international commissions on telephone matters. Over 400 friends gathered to bid him farewell at a ceremony at which Sir Archibald J. Gill, engineer-in-chief of the Post Office, presented him with a parting gift subscribed for by colleagues all over the country.

Mr. G. Hamilton

Mr. T. J. Dagley

Mr. S. R. Eade

Mr. G. Hamilton, A.R.T.C., A.I.C., general manager, lamp and glass works British Thomson-Houston Co., Ltd., since 1933, relinquished his executive duties on 31st October, but will continue to be available for consultation. **Mr. T. J. Dagley** has been appointed general manager, glass factories, and also of glass and lamp-component sales, and **Mr. S. R. Eade,** M.I.E.E., becomes manager, lamp factories.

Mr. Hamilton received his early education at Dalziel High School, Motherwell. He obtained the David Colville Medal for pure science in 1907, and attended the Royal Technical College, Glasgow, joining B.T.H. in 1911, as lamp works chemist. In 1921 he was appointed technical assistant to the manager of the lamp works, and in 1933, manager of the lamp works and director of Lamps Caps, Ltd. In 1945 he was appointed general manager of the company's lamp and glass works.

Mr. Dagley joined the B.T.H. Co. in 1906. After practical experience in several departments of the lamp works he transferred to statistical work and then devoted himself to matters concerning manufacturing efficiency. In 1913 he was appointed lamp works accountant, and in 1925 general assistant to the manager, becoming assistant manager of the lamp works in 1939, and assistant general manager of the company's lamp and glass works in 1945.

Mr. Eade obtained his early education at Daventry High School, before going to the Lawrence Sheriff School, Rugby, and the Rugby College of Technology and Arts. He joined the B.T.H. Co. as an engineering apprentice in 1924, subsequently spending ten years in the research laboratory, chiefly in connection with various aspects of sound recording and reproducing equipment. In 1939 he became lamp works engineer, in which capacity he was responsible for the design and construction of all the lamp works plant, factory layout, buildings, services, and factory engineering. He was appointed manager of the lamp factory at Melton Road, Leicester, in 1945.

Mr. J. K. Frisby has been appointed senior lighting engineer at the Leeds office of the British Thomson-Houston Co., Ltd., Mr. Frisby has been with the Lighting Department of the B.T.H. Co. since 1941,

and took up his duties in Leeds on 1st November.

Mr. H. Dixon, M.I.E.E., manager of the Central Sussex District of the South Eastern Electricity Board, whose retirement we reported in our issue of 21st October, was, before vesting date, chief engineer and joint general manager of Central Sussex Electricity, Ltd., and associated companies. Some twenty years have elapsed since the Electric Supply Corporation invited Mr. Dixon who, at that time, was manager of their Scottish areas, to develop their group of companies, viz.: Central Sussex Electricity, Ltd., the Uckfield Gas & Electricity Co., Steyning Electricity, Ltd., Burgess Hill Electricity, Ltd., and Seaford & Newhaven Electricity, Ltd. At vesting date there were 316 miles of h.v. mains, 314 miles of l.v. mains, 480 sub-stations and 23,063 consumers.

Mr. H. Dixon

Mr. A. W. Anderson has been elected a director of Telephone Properties, Ltd.

To celebrate the twenty-fifth anniversary of the setting up of the **Chloride Electrical Storage Co.'s** Bristol depot, a cabaret and dance was held at the Berkeley Empress Ballroom, Bristol, on 24th October to which motor and radio traders from various parts of the West Country were invited. The guests were received by Mr. F. Atkinson, manager of the Bristol depot.

The supervising engineer should be a man of integrity, honesty of purpose and efficiency, realizing his responsibilities not only to himself but to the industry which he serves. This definition was given by Mr. A. Brammer, general secretary of the **Association of Supervising Electrical Engineers,** at the annual dinner of the Kent branch at Maidstone on 28th October. Mr. Brammer, in responding to the toast of the Association, emphasized the growing importance of this "key man in industry" and the necessity for the proper practical training and placing of apprentices. For this he advocated the adoption of the suggested national apprenticeship scheme with indentures between guardians and a central apprenticeship board instead of individual employers.

There was no other organization more qualified by experience than their Association to deal with the installation side of the industry. The A.S.E.E. had staked its claim and, as a result of discussions now going on, it might be able to make an announcement which would please members.

Mr. H. Coulls, the immediate past chairman, received a presentation from Mr. A. N. D. Kerr, of the National Executive Committee, who also proposed the toast of "The Visitors." Responses were by Mr. C. Cameron-Kirby, of the South Eastern Electricity Board, and Mr. A. Wilson, chairman of the Maidstone Branch of the Electrical Contractors' Association.

Proposing the toast of the Association, Mr. P. G. Wallis, vice-president of the E.C.A., expressed pride in the harmonious relations which had existed between his Association and the A.S.E.E. for thirty-five years.

The Anacos Dramatic Society of **Frederick Smith & Co., Ltd.,** gave three successful performances of "The Camel's Back," a comedy in three acts by Arnold Helsby, on 13th, 14th and 15th October at the Queen's Hall, Manchester.

The fortieth anniversary of **Woods of Colchester, Ltd.,** was celebrated recently by a dinner at which the guest of honour was Sir Harry Railing, chairman of the General Electric Co., Ltd. From a small beginning in 1909 the company, which is an associate of the G.E.C., has grown into the largest single works in the world specializing solely in the complete manufacture of propeller and axial flow fans, including the electric driving motors. The founder was one of the pioneers of a.c. fan motors and one of the first to recognize that fans needed specialized types of motors. To-day the company is producing 70,000 fans a year, and in 1948 it exported one fifth of the total exports of industrial fans from this country.

The Court of the Electrical Industries Benevolent Association, acting upon authority delegated to it by the annual general meeting, has appointed the following to the Council: **Messrs. C. R. King, F. W. Lawton, H. H. Mullens** and **H. J. Randall.**

The **Glasgow Sub-Area Amateur Dramatic Club** (S.W. Scotland Electricity Board) is presenting A. P. Dearsley's comedy "Fly Away Peter" on 7th and 8th December at the Royal Institute, 158, West Regent Street, Glasgow. Tickets (2s each) are obtainable from the Sub-Area Headquarters, 75, Waterloo Street, Glasgow, C.2. Proceeds will go to the Electrical Industries Benevolent Association.

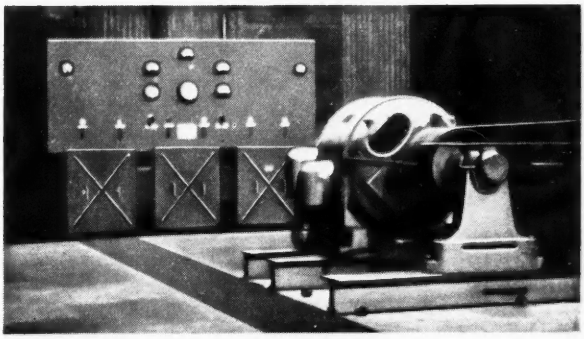
Obituary

Lady Spencer.—We regret to record the death of Lady Spencer, wife of Sir Thomas Spencer, M.I.E.E., managing director of Standard Telephones & Cables, Ltd., which occurred on 28th October. Our sympathy is extended to Sir Thomas.

A Borneo Power Station

Reconstruction with Locally Available Plant

By
R. G. BARROW,
A.M.C.T., A.M.I.E.E.



WHEN the rehabilitation began of a Shell group subsidiary company's oilfield in Sarawak, British Borneo, the impossibility was realized of obtaining generating equipment in time to put the field back on a reasonable working basis. In consequence our thoughts were turned towards the use of whatever material could be made available locally.

A number of Japanese motors had been left behind after the occupation. They

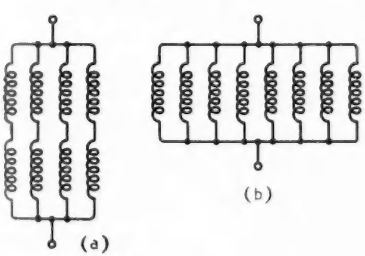


Fig. 1.—Rearrangement of coils for the conversion of the machine from (a) motor to (b) alternator, representing one leg of stator circuit

were examined with a view to converting one or more of them into alternators. The most suitable type appeared to be a wound-rotor induction motor having the following specification on its name plate: 250 h.p., 190 kVA, three phase, 0.8 p.f., 50-60 c/s, 400-440 V, 320-290 A, 735-885 r.p.m., 395-435 (rotor) V.

Although unorthodox, it was thought that if d.c. could be injected into the rotor circuit, through the slip rings, it would magnetize the rotor in a similar manner to a salient pole rotor. A welding machine was available to supply the exciting d.c. and the induction motor was belt driven by an engine for trial. The external connections in the motor cable box were arranged for star connection and the machine was driven at its normal speed of 750 r.p.m. The excitation was slowly brought up to normal and the voltage at the terminals of the machine was found to be approximately 600-700 V.

The machine was then dismantled and the stator coils re-arranged in parallel grouping (Fig. 1 (b) representing one leg of the stator circuit) but, as it was difficult to re-arrange the rotor coils, they were left alone, although it was realized that the current distribution in the rotor would be uneven, since the excitation current would have to pass down one leg and back along the other two in parallel (Fig. 2). There was apparently no detrimental effect on the stator output.

On re-assembling the alternator, a 180 h.p. Thomassen twin cylinder gas engine was arranged to drive it and a framework was fabricated locally in the machine shop to serve as slide rails,

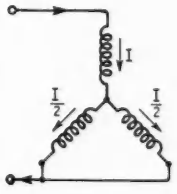


Fig. 2.—Path of excitation current

together with a pulley of suitable size. The alternator was securely bolted down to its newly made base and a 16in balata belt used to drive it (Fig. 3).

The open circuit and short circuit characteristic test curves (Fig. 4) indicated that the performance of the alternator was now within the desired range, the phase voltages being 400-440 V on the stable part of the curve at no load. Further tests with an oscilloscope clearly showed (see Fig. 5) that the wave shape resembled a perfect sinusoid, free from harmonics and slot ripple. A further investigation was carried out to prove whether altering the disposition of the excitation currents in the rotor circuit would have any detrimental effect, but with all possible connections the wave shape remained unaltered. Taking all test results into consideration, it was estimated that 150 kVA at 0.8 power factor could be obtained.

While our work in connection with the alternator was proceeding details of the switchboard and exciters were arranged to fit into the general scheme, to complete

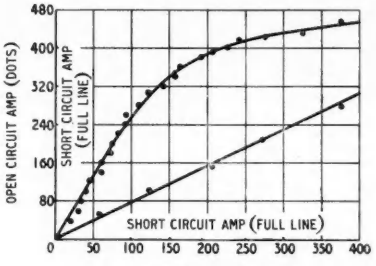


Fig. 4.—Open and short circuit characteristics

machine would now have to maintain a heavy output current at a stable voltage of about 15 V, the shunt coils (which were previously connected in series) were connected in parallel and the series coils (previously differential) were connected for cumulative compounding (Fig. 6).

The performance was considerably improved. The machine built up easily and was more stable, but the series field still predominated, resulting in poor control on the shunt regulator. This was easily overcome by reducing the series turns until a point had been reached which satisfied all requirements.

The switchboard proved to be our most difficult task. Three metal-clad panels of Japanese

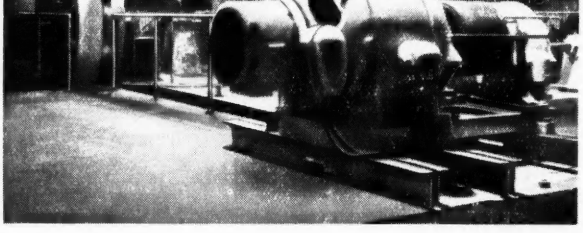


Fig. 3—The converted machine

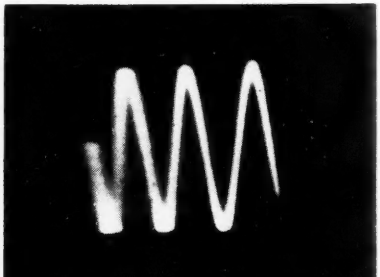


Fig. 5.—Output voltage oscillogram

our station and to get it on load as soon as possible.

A pre-war d.c. welding machine of the drooping characteristic type was investigated to see if it could be used as an exciter. The nameplate data were 80/25 V 350 A, 1,200 r.p.m. This machine was belt driven by an engine and arranged for an initial test, which showed that the series field predominated. Arrangements were made to strengthen the shunt field and to weaken the series field. Since the

origin were found with two three-phase 200 A contactors in each with magnetic blow-out coils and arc chutes. It was from this basic material that the switchboard was made up. A metal-clad panel was designed to sit on top of the contactor panels, forming the main instrument panel, carrying the bus bars, overload coils, regulators, etc. The centre pair of contactors were arranged to control the alternator and the remainder to control the outgoing feeders. Eighteen overload coils were found and incorporated in the six circuits of the switchboard. The dashpots of the overload coils were arranged at the back of the board to hang outside to facilitate adjustment and were calibrated with the use of a variable core welding transformer. The shunt regulators were made up from redundant degaussing gear taken from the company's L.C.T's and the mechanical parts

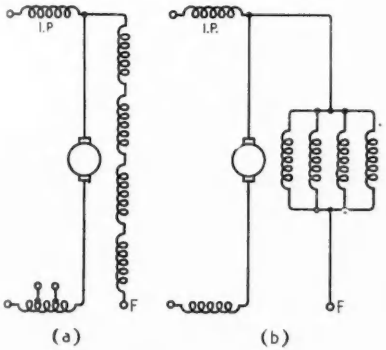


Fig. 6.—Alternative means of excitation

altered to suit, the resistance value being made to suit the characteristics of the exciter's shunt field. The push-button contacts for controlling the contactors were made up from rocket firing keys, also taken from the L.C.T's. The remainder of the items for the switchboard were made up in the local machine shops which did an outstanding good job, producing dashpots and plungers, bus bar supports and sundry other modifications and fabrications, which made our switchboard possible.

With the main items completed, some thought had to be directed towards assembling the whole into a complete working scheme. A disused gas - compressor station was selected as the new power station, as it had two 180 h.p. gas engines lying idle, a good building, with an over-

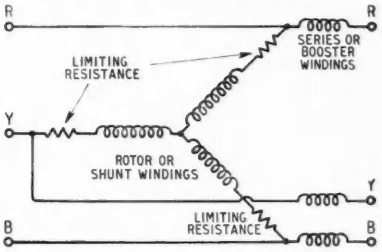


Fig. 7.—Induction voltage regulator showing phase resistors

head crane. Since the exciters ran at 1,200 r.p.m. and the prime movers at 200 r.p.m., a shaft extension was indicated. Two 4ft diameter vee-groove pulleys were obtained from salvage and suitable shafts fitted. These were coupled to the engine shafts and outboard pedestal bearings fitted to each. The exciters were lined up to the new extension shafts and bolted to their locally fabricated slide rails, being driven by five vee-belts.

The redundant compressors were removed from the station and new foundation bolt holes made for the alternator framework in the existing concrete block. The alternator was then lined up with the engine pulleys and the new frameworks grouted.

Voltage Regulation

Since the site of the new station was not at the electrical centre of the distribution system, one of the longer feeders required some form of voltage regulation. This was achieved by converting a 100 h.p. wound-rotor induction motor into a three-phase voltage regulator. The machine was dismantled and the stator winding was re-arranged in parallel grouping similar to that of the converted alternator. The reason for this reduction of stator turns was to reduce the voltage boost, which was previously too high, the stator winding now becoming the series or booster winding. Some mechanical alterations were also necessary and a

quadrant and hand wheel were made up and fitted to rotate the rotor to achieve the required voltage boost.

A mechanical drum-type brake was considered necessary to guard against the possibility of excessive torque, which might be produced as a result of a "short" on the feeder; this was made up and fitted at the other end of the shaft. On trial this voltage regulator (Fig. 7) proved entirely satisfactory, but the phases had to be carefully balanced on full load, so a suitable resistance had to be inserted in each phase of the rotor (shunt) winding to reduce excessive magnetizing current. The I^2R loss in these resistances may be wasteful, but the circumstances allowed no alternative. Since the star point of the rotor winding was inaccessible, it was necessary to employ that as the shunt winding. The stator winding could then be re-arranged for six terminals. Since the machine was unable to cool itself, an external fan was arranged to draw cool air from outside over the windings.

It is not claimed by the author that what has been achieved is by any means orthodox practice, but this article has been written with the hope that other electrical engineers in remote parts, cut off from readily available material and from discussion with their fellows, may benefit in similar circumstances.

European Recovery

REPORT OF O.E.E.C. MACHINERY COMMITTEE

WE have received from the Secretary-General of the Organization for European Economic Co-operation a copy of a report of the Machinery Committee, which is to form part of Vol. III of the Organization's interim report on the European Recovery Programme.

In this some indication is given of the production programmes of the mechanical and electrical engineering industries of France, Italy, the United Kingdom and Western Germany, but it has been found impossible to allocate the total figures between branches of these industries. The 1949-50 programme aimed at raising production to the following levels, with 1938 = 100 as a basis: France 128, Italy 125, the United Kingdom 155 and the Bizone of Germany 72. Figures for the 1952-53 programme are as follows: France 164, Italy 170, the United Kingdom 161 and Germany 104. The volume of production in millions of dollars and imports from the United States are set out, but the figures have been rendered of doubtful value by the recent alterations in exchange rates. This also applies to statistics of European trade.

Chapter 3 of the report is a preliminary study on the production of equipment for power stations. Approximate figures supplied by the participating countries indicate that power installation projects for the 1948-53 programme amount to about 22,000 MW, not allowing for normal replacements and German reconstruction.

The Committee concludes that there are at present possibilities of placing orders for heavy electrical equipment in Europe, but contracts should be placed without delay. It is recommended that orders should be for plant similar to that previously purchased and that orders should be grouped to enable a certain number of machines to be mass-produced.

There is a recognition of the limit imposed by the amount of material available. For instance, it is thought that special measures will have to be taken by the steel industries to meet the demand for magnetic sheet. That demand for 1949-50 is put at 40,000 metric tons for France, 30,000 tons for Italy, 12,000 tons for Switzerland, 32,000 tons for Germany and 160,000 tons for the United Kingdom.

European technique is considered to be at least on a level with that of the rest of the world and European industry should be able to satisfy almost all the needs as it has done in the past.

The O.E.E.C. Council has recommended that the participating countries should approach European suppliers of power plant before placing orders in the United States and so far as possible limit their orders to existing types of machinery to avoid delay.

As regards small electric motors (up to 10 h.p. French rating) the Committee has ascertained that the total production of the participating countries will be sufficient to meet the requirements. It is noted that Austria, Belgium, Denmark, Italy and the United Kingdom are exporters of small motors and that in the near future other countries will also reserve part of their production for export.

At present the European production of enamelled wire has been inadequate, but a considerable improvement is expected during the next few years. Italy, it is said, can now export wire of all gauges.

Transmission at 380 kV

DETAILS OF A SWEDISH SCHEME

IN a recent publication of the Swedish State Power Board, Mr. Ake Rusck, director general, and Mr. B. G. Rathsman, chief engineer, discuss problems arising from the use of 380 kV for the transmission system to be constructed between Sweden's biggest waterfall at Harspranget, 22 miles north of the arctic circle, and the load centres in the south, about 600 miles away. Midway come the existing water-power stations (1,200 MW) around Midskog from which starts the present 220 kV system of six lines to the south.

Economically exploitable water-power schemes in Sweden are estimated to have a potential annual output of 50,000 million kWh, of which 85 per cent is in this northern area and 15 per cent is in the south, whereas the population bears a converse relationship. Expected growth of consumption within a few years would have entailed adding a 300-mile 220 kV line each year from Midskog, apart from the need to deal with the output of the projected 290 MW Harspranget station. The Power Board decided, therefore, to superimpose a 380 kV (400 kV maximum) system linked to the 220 kV system at Midskog and terminating at a substation at Hallsberg in the Stockholm district, which would be commissioned early in 1952.

Arrangements at Harspranget

Initially, the Harspranget station will contain three 105 MVA 167 r.p.m. turbines operating under a 350ft head. The subtransient reactance of the alternators will be 15 per cent and the transient reactance 22 per cent. Generated voltage, 16 kV, will be stepped up by a common group of three single-phase five-core transformers, each of the three centre limbs being connected to one phase of each alternator by a 16 kV air-blast circuit breaker. Equipment will include three 40 MVA reactors. Two 60 MVA reactors and a 75 MVA hydrogen-cooled synchronous condenser are being installed at Hallsberg.

The steel transmission towers, which have a minimum tensile strength of 33 tons/sq in, are similar in type to those employed at 220 kV. Each weighs 7.1 tons, corresponding to 36.2 tons/mile. The standard span is 1,080ft, the height of the cross arm above ground is 75ft and the phase clearance is 39ft.

Two 0.918 sq in steel-cored aluminium conductors (diameter 1.25in) are used per phase (0.512 sq in in copper equivalent) tensioned to 3.8 tons/sq in at 0 deg C in free suspension. The sag of a normal span at 50 deg C is 33.5ft. On the crossbar of each tower are mounted two arms for supporting the 0.109 sq in steel earth wires. Double-conductor construction with a clearance of $17\frac{3}{4}$in between the two sections, compared with a more costly single tubular conductor of larger diameter, reduces reactance by 26 per cent, improves stability and raises the critical corona voltage. These advantages would have been greater with multiple conductors, which are, however, held not to be worth the extra cost and complication.

Line Characteristics

With the conductor arrangement chosen, the resistance and reactance values per phase per mile will be 0.0442 and 0.53 ohm, respectively. Line capacitance will amount to 0.0177 μF/mile corresponding to a reactive power of 800 kVAr/mile at 380 kV. Distance pieces will be fitted between the conductors at every 400 to 500ft, because whereas electrostatic forces are mutually repulsive, electro-magnetic pull at heavy current might draw them into contact not to be released until the current fell to a lower critical value. Also, in view of corona, the conductors must not approach one another more closely than 8in, apart from sway due to high winds.

Standard strings of 20 insulators, spaced at 6.7in, will have a total length of $13\frac{3}{4}$ft and will be fitted with arcing horns at the upper ends and grading rings at the cable ends. Single strings will support a working load of 4 tons, which is adequate for 95 per cent of the towers. Tempered high-tensile glass insulators are to be used to some extent to reduce the number of double-multiple strings. The

flash-over clearance across the string is 115in. The impulse strength is 1,580 kV and at power frequencies the breakdown voltage is 940 kV when dry and 760 kV when wet. There will be twelve vibration dampers per tower.

The station impulse level of 1,775 kV on 1/50 full wave as required by Swedish standards for 380 kV, could have been reduced by 20 per cent since solid earthing is to be adopted instead of Petersen-coil earthing, with which arc extinction has lately become uncertain on the 220 kV system with its 1,900 miles of transmission lines. Nevertheless, since the voltage to neutral at the open end of a 380 kV line might exceed 200 per cent of normal in the event of an earth fault and surge divertors must allow a safe margin for ordinary over-voltages, the practical difference is but 14 per cent and the reduction in transformer costs only 5 to 9 per cent, 1,775 kV has been specified overall.

Initially the 380 kV system is to be equipped with seven air-blast circuit-breakers rated at 1,000 A and 8,000 MVA at 350 kV. This leaves ample margin for future expansion, as the short-circuit power for the next few years will not be more than 2,300 MVA. The breakers will incorporate non-linear resistors to reduce switching impulse voltages. Total breaking time is about 0.1 sec and operating pressure is 15 atmospheres. Distance protection with supplementary-carrier-current protection will be employed, limiting single-phase disconnection (with high-speed reclosing) to the affected phase. Line losses when transmitting maximum power will be about 25 MW (including 2 MW for corona) during the first few years.

Estimated costs of the scheme are: transmission line, £6.1 million; transformer stations at Harspranget, Midskog and Hallsberg, £2.8 million; power station at Harspranget (excluding transformers), £7.1 million; total £16 million.

In addition, new power stations will come into operation in 1952-53. One of these, of 100 MW, will be at Storfinnforsen, 35 miles north of Midskog, and another of 240 MW at Kilforsen to be connected to the former by a 20-mile line at 380 kV, which will later serve as a bus-bar system for all stations in the area. Six 380 kV lines are expected to be required ultimately to transmit all the hydro-electricity available.

Stress Determination

Viewing Models Under Polarized Light

THE employment of "photo-elastic" methods of studying the values and directions of the principal stresses in ship design was discussed by Mr. J. A. H. Paffett (Dept. of Naval Construction, Admiralty) in a paper he recently read before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne.

When attempting to solve a two-dimensional stress problem, a transparent model was made of the component part in which the stress distribution was required to be indicated. The model was loaded and examined under polarized light in an instrument that revealed dark and coloured bands which, in theory, enabled the stresses to be more easily calculated.

A diffused light plane polariscope used for such determinations was described in the paper and also certain kinds of plastic materials used for making the models.

The author deduced from his tests that when calculating stresses from wire-resistance strain gauge measurements with xylonite models, it was reasonable to allow a gauge factor of 90 per cent of the makers' figure and that the answer might be up to plus or minus 10 per cent in error.

He therefore considered the wire-resistance strain gauge to be a very approximate instrument at present, when applied to ship-type models. However, there were many stress problems in ship design to which a quick answer accurate to 25 per cent would be a blessing. The wire-resistance gauge was probably as accurate as any of the "photo-elastic" compensation methods for ship-type model tests.

E.I.B.A. Ball

THE Electrical Industries Benevolent Association has had so many applications for tickets for the Annual Ball at Grosvenor House on 11th November that it has had to announce with regret that no further requests for tickets can be considered.

Electricity in London

I.E.E. Supply Section Chairman's Address

IN his chairman's address to the Supply Section of the Institution of Electrical Engineers last week, Mr. J. W. Leach described the organization of the London Electricity Board of which he was chief engineer until his retirement last February.

Before nationalization, the supply of electricity in the Area was controlled by thirty local authorities and ten companies. Owing to London's density of population this involved an over-lapping of systems with extensive duplication of assets independently used.

The Board's Area is divided into seven Sub-Areas and forty-seven Districts. The aim is an organization based on a multiple unit system of districts, which readily lends itself to decentralization. Normally a district comprises a main supply station, or equivalent section of a generating station, with its associated plant, buildings, networks and works depot; the unit is visualized as having an installed capacity for distribution of about 50 MVA. Each Sub-Area contains a number of such units comparable for the purposes of design, construction and costing and for delegation of control. While a District may at present correspond to a borough, as the load grows districts may have to be subdivided, generally with another bulk supply station.

Future Requirements

Electrically, the development of London has extended over a long period, some of the many and widely differing systems being uneconomical and unsuitable to bear their existing loads. The only known requirement of the future system is that it shall provide a three-phase four-wire 50 c/s supply at 415/240 V.

The aggregate maximum demand upon the London Electricity Board during the winter of 1948-49 was 1,218.5 MW. Graphs shown by Mr. Leach indicated that at the present time this figure is increasing by about 100 MW per annum. The chairman spoke of the increased generating efficiency and said that when the existing programmes of generating station development are completed there will be a substantial improvement of efficiency, but thereafter further reductions will be slow in accomplishment. It is more likely that economies will be effected by reducing building costs and the coverage or accommodation at power stations of some sections of the plant.

With nationalization electricity supply areas are now large enough for long-term planning to be effective, but rural engineers should make it clear that the supply industry must be left free to plan and execute economically the necessary works in good time to meet the demand.

Necessity for Research

Mr. Leach suggested immediate research into distribution and transmission problems and the setting up of better statistical records, bearing in mind the considerable potential capital expenditure which faces the industry. In this connection he called the early attention of the new Electricity Supply Research Council to transmission and distribution.

At the present time there is a great opportunity for engineers to obtain the maximum benefit from the larger units now being operated and to effect great economies, since there is now freedom from many of the previous limitations arising from independent operation of too-small units. If the savings are used to lower tariffs this will sow the seed for increased use of electricity and greater diversity. Mr. Leach hoped that the gains would not be absorbed for other purposes or in over-centralization, accountancy and sales campaigns.

Electrical engineers will be judged not by their technical cleverness, but on their success in providing an adequate, reliable supply of electricity at a steadily declining cost and charge to the consumer.

Mr. E. T. Norris, a past-chairman of the Section, presided at Mr. Leach's induction in the absence abroad of the retiring chairman, Mr. C. O. Boyse, who spoke to the meeting by radio-telephony from New Zealand.

Rural Supplies

Economic and Technical Aspects

ELECTRIFICATION of rural areas was not an independent matter, but was closely allied to much wider subjects, including town and country planning. That was one of the opinions expressed by Mr. G. A. Robertson (manager, No. 4 Sub-Area, North-Western Electricity Board) in his address at Preston as first chairman of the newly formed North Lancashire Sub-Centre (North-Western Centre) of the Institution of Electrical Engineers.

Statistics relating to the fourteen Area Boards showed that 18 per cent of the population concerned inhabited 87 per cent of the total area they served, which indicated the task involved in "almost complete" rural electrification in accordance with the mandate contained in Sec. 1 (6) of the Electricity Act, 1947.

If, therefore, politically and socially, electricity was regarded as an essential service in such areas, should the inhabitants be entitled to light, heat and power irrespective of their ability to pay the full cost of providing the supply? Further, if they were unable to meet the whole cost, should the Government make a grant or subsidy for this purpose?

Full Use Essential

At the present time the average revenue per farm was estimated to be about £20 per annum. To ensure an adequate return on the capital expended it was customary to enter into special arrangements with rural consumers. Thus, it was both essential and proper that, once the supply was made available to rural consumers, they should make full use of it; guarantees should be based upon the amount of energy which could be usefully consumed, not on the amount the customer wished to consume if the latter figure were less. The speaker considered that facilities for the hire-purchase of agricultural equipment should be made available by the Area Boards.

Subsidies could be either "internal" or "external"; the former might be by the urban consumers paying a higher price than would otherwise be the case or by a general levy within the industry, while the latter involved subsidy by the Government as in certain other countries. The speaker considered there should be subvention by local authorities in rural areas by means of rate relief, or other agreed method, apart from whether or not any State aid was forthcoming. In the latter connection grants were already made in certain cases under the Hill Farming Act of 1946.

Keeping Down Costs

The speaker reviewed past attempts to reduce distribution costs in rural areas and included tabulated technical and financial data. The conclusions reached were that future rural extensions would be mainly overhead, but that the Area Boards should be prepared to co-operate in preserving amenities of the countryside and, for this purpose, be willing to incur a certain amount of additional expenditure if necessary. There was room for both single- and three-phase systems, the latter for sparsely populated areas and isolated farms where motor sizes were never likely to exceed about 10 h.p. and no large heating load was envisaged.

The British Electricity Authority and Area Boards were engaged on the preparation of "master" plans for rural development to ensure the construction in an orderly manner of a comprehensive primary network of high voltage mains forming the "backbone" and "ribs" of a complete rural network for each area. Detailed surveys of the areas and premises concerned were a prerequisite of the preparation of such plans.

In arriving at any future commercial policy, the B.E.A. and Area Boards would have to find answers to the following fundamental questions:—

(1) Should a national policy and plan for electrifying all rural areas be adopted, or should each Area Board decide its own policy and plans, possibly within a broad framework of national policy?

(2) To what extent, if any, should there be a pooling of financial re-

sources by the Area Boards for rural development?

(3) Should there be a special "Farm" tariff and, if so, should it be on a national or Area basis, and what shall be the structure of such a tariff or tariffs?

(4) To what extent would it be necessary to demand capital contributions, guaranteed revenues, or line rentals from rural consumers?

(5) To what degree could standardization in design, layout and construction of rural networks and services be usefully adopted.

It was estimated that there were more than 150,000 farms still to be electrified. During the first year under nationalized control approximately 9,000 additional farms were connected, a satisfactory achievement having regard to present-day restrictions; there were now over 90,000 farms connected in England, Wales and Scotland. A serious problem was the shortage of trained technical staff well versed in electro-farming methods.

Prejudiced Comment

THE following "leading article" appeared in the *Sunday Express* of 30th October:—

"PLANNERS AT WORK!"

"How did the State electricity planners spend the most wonderful summer on record?

"On making use of those perfect days of low-power demand to overtake arrears of plant maintenance, to hurry forward power station construction?

"It would hardly seem so. The news has been of a jamboree at Torquay which, kept the British Electricity Authority officials hanging around for three care-free days. Time and money have been frittered away on exhibitions and on displays at agricultural shows. Energy has been wasted on plans to compete with the small shopkeeper who sells radio and electrical goods.

"Now with the coming of the first coldish days of autumn, long-suffering consumers taste once more the miseries of 'load shedding'—lamps that won't light, fires that won't warm, cold water, cold breakfasts.

"Even worse appears to be in store. For power station engineers were reported last night to be feeling 'great anxiety' about to-morrow's cuts. They fear a breakdown in electricity supplies.

"The planners have failed to concentrate on essentials. The power station programme limps behind schedule. It is time that some sense of urgency was shown."

We do not conceive it as our duty to act as the defenders of the British Electricity Authority and Electricity Boards, but we are very much concerned with the possible adverse effect upon the electrical industry of this kind of criticism.

Those who attended the Torquay Convention will laugh at the idea that the crowded programme allowed much time for a "jamboree." The "carefree days" mentioned (five, not three) were well spent by the delegates in improving their knowledge of their own and allied industries and making valuable contacts which served to strengthen the links between the electricity supply authorities, electrical manufacturers and electrical contractors. It must be remembered that the Convention was also attended by these others; it was not just the private party the *Sunday Express* implies.

Exhibitions and displays at agricultural shows are usually considered by the *Sunday Express* to be of value, but participation by the electricity authorities is regarded as a frittering away of time and money.

Our contemporary knows (or should know) very well that the greatest endeavours have been made to overtake arrears of plant maintenance, and it also should be aware that a great deal of plant is working beyond its allotted span, thanks to the policy forced on the wartime Government by the circumstances of the time. By a little investigation the *Sunday Express* could have discovered how much is being done by the B.E.A. to hasten the provision of new generating plant. If it had taken steps to be informed that leader could not have appeared.

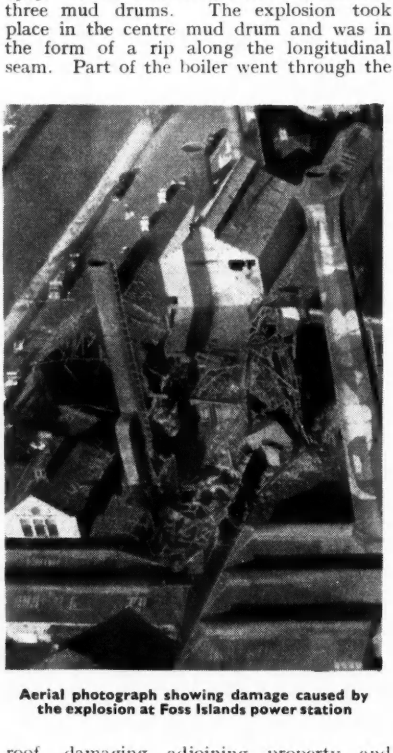
What is most objectionable is the suggestion that all this is something new, deriving from nationalization. Did the industry never hold a convention before 1948? Did electricity supply authorities never show in exhibitions? Was there always plenty of plant and were there never any power cuts? And did no company or municipal undertaking ever sell appliances?

The *Sunday Express* would serve the community better by explaining the power situation and securing public co-operation in tiding over the present difficulties.

Boiler Explosion at York

FOSS ISLANDS STATION SHUT DOWN

AN explosion occurred at 4.23 a.m. on 27th October on No. 1 low pressure boiler at Foss Islands power station, York, in the North Eastern Division of the British Electricity Authority. This boiler, of 59,000 lb/hr at 200 lb/sq in and 600 deg F, was made by John Thompson and installed in 1929. It had three steam water drums and three mud drums. The explosion took place in the centre mud drum and was in the form of a rip along the longitudinal seam. Part of the boiler went through the roof, damaging adjoining property and bringing down both engine house and boiler house roofs to a considerable extent. The crane was displaced from its girders and fell, one end into the engine room and the other supported by the outside wall.



Aerial photograph showing damage caused by the explosion at Foss Islands power station

Four men were sent to hospital, two being detained. One man is unaccounted for.

Day and night work was undertaken to shore up the crane, which has now been accomplished and a start has been made on clearing the debris. The North Eastern Area Board has given the North Eastern Division all the help in its power and so made it possible to restore supplies to consumers by late the same evening, except for one small d.c. feeder. Damaged 3.3 kV switchgear was cut out and the healthy portion recommissioned. A 45 MVA circuit between Osbaldwick and Melrosegate and a 20 MVA circuit between Melrosegate and Foss Islands, which were affected by the explosion, were back in commission at about 6 p.m. The generating station itself, of course, is completely shut down and York is in consequence depending upon imported supplies.

A preliminary survey, which will need confirmation when debris has been moved, leads to the belief that within a few days the high pressure boilers and Brush-Lüngstrom set will be back in commission and able to generate to full capacity. This end is being actively pursued, and considerable roof repairs and a temporary end-protection will require to be built. A start has now been made on this. At the moment it would appear that Nos. 1 and 2 boilers and No. 1 machine, of a capacity of 3,500 kW, will be permanently out of commission.

There can be no question of any faulty repair work, either welding, riveting or caulking being responsible for the accident as the particular drum has never given any trouble and has never shown any signs of leakage. Boiler insurance examinations, etc., are in order.

The boilers have been operated since vesting day with the same care and attention as is given to the major stations in the Division and it would appear that the result of a metallurgical examination must be awaited before it is possible to reach any conclusions regarding this disaster.

Western Australian Estimates

THE Premier of Western Australia, Mr. McLarty, states that for the present financial year the estimated expenditure of the W.A. State Electricity Commission is £A3,535,000, of which approximately £A2,500,000 will be spent on the new South Fremantle power house. A sum of £A749,000 has been provided for the south-west power scheme, and the Commission will increase the capacity of the Collie power station from 5,000 to 12,500 kW. Total expenditure on this addition will be in the vicinity of £A325,000.

Industry and the House

Cuts in Electrical Development

BY F. J. ERROLL,
M.A., A.M.I.E.E., M.P.

AFTER a week of waiting, the House of Commons was eager to hear the statement of the Prime Minister which was to give the Government's proposals for dealing with the economic situation. Ministerial speeches and asides during the previous fortnight had led everyone to expect unpleasant measures —indeed, the 5 per cent increase in the profits tax was regarded as but a foretaste of what was to come.

Mr. Attlee's manner is always calm and dispassionate to a fault, and he successfully withheld every appearance of drama from his Commons announcement. Small reductions in widely varying fields are to be made. These are to be imposed gradually and in such a way as to cause the minimum disturbance to those affected. Some reduction in capital expenditure, notably "a substantial contribution from the large programmes of capital expenditure of the fuel and power industries," was nevertheless essential. He left it to the Chancellor of the Exchequer to define these in more detail.

Chancellor's Statement

Two days later Sir Stafford Cripps opened a debate on the Government's proposals which filled in the details and included a characteristic exhortation to the nation. He had especially bad news for the electrical industry. As the fuel and power investment programmes provisionally approved for 1950 involved a total expenditure of £237 million, it had become necessary to reduce this by £25 million. He went to to say: "The larger part of this cut will come from a reduction in capital expenditure on electricity development in 1950. The electricity programme is by far the heaviest of all the fuel and power industry investment plans, accounting for more than half the total." The cut will fall mainly on the distributive side. The rate at which new connections are made and schemes of rural electrification implemented will suffer a check. Sir Stafford hoped that this brake upon the progressively increasing load would ease the demand on the country's overtaxed generating capacity.

This attack on electricity supply expansion in 1950 serves to focus a criticism heard throughout the debate, and repeated in many parts of the country, which relates to the Government's policy as a whole. These 1950 cuts will do nothing to help the country in the winter of 1949. Indeed it is questionable whether they will take place at all, since the Government has failed to insist previously on intended cuts. When the time comes to restrict the development of rural electrification in the spring of 1950, will the Government be firm, especially when the general election will be imminent and farm votes will assume great importance?

In any event the object of the economic proposals as a whole was to enable the country to readjust itself to the consequences of devaluation, and to stop drawing on our last gold and dollar reserves, already down to the absolute lowest minimum that was considered safe two years ago. Will cuts on capital investment to be imposed six or nine months hence do anything to help the immediate difficulties? It seems hardly likely.

Opposition Criticisms

Speaker after speaker in the debate put the plain facts of the situation. The country is not paying its way. More must be exported to pay for imports of food and raw materials. Further, devaluation means that still more must be exported to pay for the same volume of imports, at least from the dollar area. Devaluation was a help in selling to the dollar area, but only if taken advantage of quickly. There were few signs in the Government's policy that it was taking effective steps to put the balance right.

For manufacturers and men alike, it was to be exhortation alone, with all the economic forces working the other way. What greater incentive to hard work

than the prospect of owning a home of one's own; yet house building for private ownership was to be cut. What better reward for energy and enterprise than to keep what one had earned; but profits tax is to be increased, and wages frozen.

As with the debate on devaluation, so did this second debate close on an electioneering note. Mr. Churchill, in the closing speech for the Opposition, reaffirmed his belief in the consuming power of the people. To the Government consuming power was an evil, even in the home market, which must be curbed.

The operation of the laws of supply and demand, the regulation of consumption by the price mechanism, were ruled out as part of the devices of outworn capitalism. Everything possible was done to stigmatize the inventor and the profit earner. Mr. Churchill believed that a reduction of £500 million in Government expenditure was the minimum needed. A cut of £90 million in the current annual expenditure of £3,300 million was "hardly worth calling an achievement." Finally he appealed to the Government to drop the Parliament Bill and the Steel Bill which were bound to divide the House and increase party strife.

The Prime Minister, after the poor reception accorded to his broadcast, was determined to defend his policy. The cuts were reasonable and properly related to the needs of the people. Those who advocated bigger cuts should say where they should be made. Management and workers were getting together, and he believed that the response had been very good. As regarded the Steel Bill he wondered why the Labour Party was always being urged to drop it for the sake of national unity. Why should not the Conservative Party accept it for the sake of unity.

The House then recorded its biggest Opposition vote of this Parliament—222—against the Government, and another stage in the battle of positions for the general election had been reached.

PARLIAMENTARY NEWS

By Our Special Reporter

GIVING further details, during the recent House of Commons debate on the Government's economy cuts, Sir Stafford Cripps said that the fuel and power investment programmes provisionally approved by the Government for 1950 involved a total expenditure of £237 million. The Government had decided that it was necessary to cut this total by some £25 million. The larger part of this cut would come from a reduction in capital expenditure on electricity development in 1950. The electricity programme was by far the heaviest of all the fuel and power industry investment plans, accounting for more than half the total. Capital expenditure on gas would also have to be reduced in about the same proportion. Some small reductions would have to be made in the plans to expand the oil refining industry and in certain of the plans of the National Coal Board.

The cut to be made in the capital expenditure of the electricity industry in 1950 would fall mainly in the sphere of distribution. We could not afford to provide new supplies of electricity as rapidly as we should have liked, and some check must be imposed on the rate at which new connections were made and schemes of rural electrification were implemented. With the present shortage of generating plant it was, in any case, undesirable for the industry to take on heavier and heavier consumption loads, which were bound to aggravate the problem of closing the gap between demand and capacity.

The effect of the cut to be made in investment by the gas industry would be to postpone large measures of integrating gas supply planned to improve efficiency and reduce costs, which the Gas Boards expected to be able to start next year. Those schemes, however, would not in any case have matured for a very considerable time.

The Government recognized the great importance of colliery reorganization and development as a means of getting more and cheaper coal.

Colour Television

The Postmaster-General (Mr. Paling), replying to Mr. Erroll, said that the B.B.C. informed him that some experiments on the basic principles of colour television had been started in the Corporation's research laboratories, where a study was being made of all developments, at home and abroad, relating to colour television. The Post Office Engineering Department, so far as it was

concerned, had kept in touch with these developments and had been studying methods of the point-to-point transmission of television signals which would be required, if colour television broadcasting were introduced.

Engineering Standards

Mr. Parkin asked the Minister of Supply if the committee he set up under the chairmanship of Sir Ernest Lemon to investigate standardization in the engineering industry had completed its work.

Mr. G. Strauss said that Sir Ernest Lemon's Committee had now completed its investigations and had sent him a final report. The Report reviewed the problem of standardization, simplification and specialization in engineering goods and made a number of recommendations. Certain recommendations about the British Standards Institution were made. These had already been acted upon. The Institution was strengthening itself to deal with the increased work likely to fall to it and the President of the Board of Trade had appointed a committee to consider its organization.

The main recommendations in the Report dealt with the action which not only manufacturing, but also using industries should take to reduce unnecessary variety in engineering production. He earnestly hoped they would be studied carefully by every section of the industry. Where the recommendation affected socialized industries, Government Departments and other public bodies, they had already been drawn to the attention of the authorities concerned. They were being considered by his own Department in relation to its extensive purchasing activities.

The United Kingdom side of the Anglo-American Council on Productivity had recently concluded an inquiry into the extent to which concentration on a limited range of manufacture had assisted production in America. Their conclusions were very much in line with those reached by Sir Ernest Lemon's Committee.

Henley Education Scheme

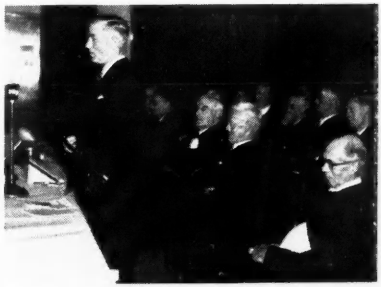
THE seventh conversazione arranged in connection with the Henley Education Scheme was held on 29th October at Woolwich Polytechnic. The proceedings were opened by Mr. F. W. M. Anderson, director and general manager, who, after reminding his audience that the Education Scheme was inaugurated in 1942 and outlining the principal facilities provided, strongly urged the boys to take full advantage of it.

Sir Montague Hughman, chairman of the Henley organization in presenting the prizes, said that some of the students to whom he had handed awards at earlier gatherings were now filling responsible positions in the organization.

Mr. F. Bray, C.B., Under-Secretary, Ministry of Education, gave an address in which he stressed that responsibility called for a trained mind. He regarded character, however, as being even more essential. He advocated the pursuit of general education over a wider field than that covered by vocational studies. Industry to-day was more alive than ever it was to the needs of young people, and, speaking generally, all the ingredients of good education and training for industry were available to-day, in the works, the technical colleges and in the home.

Mr. R. H. Hore, a student apprentice at Henley's Gravesend works, speaking on behalf of the students, expressed appreciation of the benefits they derived from the Education Scheme, and thanked the directors and officials of the company for their help and guidance.

Mr. S. E. Goodall, M.Sc. (Eng.), M.I.E.E., chief engineer of Henley's, thanked Mr. Bray for his talk and expressing on behalf



Mr. F. Bray speaking at Henley's Conversazione showing (left to right in foreground) Sir Montague Hughman (chairman of the Henley organization), Mr. F. W. M. Anderson (general manager), and Mr. W. F. Bishop (director)

of the Education Committee appreciation of all those who had contributed both to the successful year and to the organization of the conversazione.

Dr. P. Dunsheath, C.B.E., M.A., director, and chairman of the Henley Education Scheme, presented the awards for student handicrafts.

Next Week's Events

Monday, 7th November

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "Electrical Weighing," by Dr. H. I. Andrews.

CARDIFF.—South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "Some Projects favourable to Direct Current Transmission, and the Role of the British Electrical Industry in Relation thereto," by F. J. Erroll and Lord Forrester.

LEEDS.—Gt. Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Industrial Switchgear Installations," by A. T. Crawford and J. Dalton.

LIVERPOOL.—Liverpool Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "The Motor Uniselector and the Technique of its Application in Telecommunications," by W. H. Grinsted.

LONDON.—Savoy Place, London, W.C.2, 2.30 p.m. and 5.30 p.m. I.E.E. Measurements Section. Symposium of papers on Ferromagnetic Materials. (Continued on 8th November.)

MANCHESTER.—At the Geographical Society, 16, St. Mary's Parsonage, 7 p.m. Junior Institution of Engineers, North Western Section. "Ward Leonard Control of Planing Machines," by J. Blackburn.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North Eastern Centre Radio and Measurements Group. "Some Considerations in the Design of Negative-Feedback Amplifiers," by W. T. Duerdoth.

ROMFORD.—Mawney's Arms, Mawney's Road, 8 p.m. A.S.E.E. North East London Branch. G.E.C. film on "Cathode-Ray Tubes."

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Electrical Apparatus in a Modern Hospital," by L. L. Emmett.

Tuesday, 8th November

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. Lecture on "Some Aspects of Agricultural and Horticultural Electrification in North America," by F. E. Rowland.

DERBY.—Electricity Showrooms, 6.30 p.m. I.E.E. East Midland Centre. "The Testing, Reconditioning and Servicing of Domestic Appliances," by H. Hobbins.

LONDON.—85, The Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "Boiler Feed Water Treatment," by H. Hillier.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurements Group. Discussion on "Protective Gear Testing Technique," to be opened by Messrs. J. E. Peters, E. Roscoe and P. S. Couldrey.

Wednesday, 9th November

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North East Scotland Sub-Centre. Discussion on "Education for Engineering," to be opened by Dr. E. Wilkinson, H. J. Revell and R. T. Pirie.

BLACKBURN. — N.W.E.B. Demonstration Theatre, Darwen Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "The Testing, Reconditioning and Servicing of Domestic Appliances," by H. Hobbins.

BRADFORD. — Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Electrical Equipment of Machine Tools," by C. Rhodes.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "The Detection by Oscillographic Methods of Winding Failures during Impulse Tests on Transformers," by E. C. Rippon and G. H. Hickling.

LONDON.—I.E.E. London Students' Section, 2.30 p.m. Visit to Hoover, Ltd., Perivale.

MAIDSTONE.—Royal Star Hotel, 7.30 p.m. A.S.E.E. Kent Branch. Film show.

WEYMOUTH.—Royal Hotel, 6.30 p.m. I.E.E. Southern Centre. "The Development of Q-Meter Methods of Impedance Measurement," by Dr. A. J. Biggs and Dr. J. E. Houldin.

Thursday, 10th November

DUNDEE.—Royal Hotel, Union Street, 7 p.m. I.E.E. North East Scotland Sub-Centre. Address by the chairman of the Scottish Centre, Professor M. G. Say.

LONDON.—Savoy Place, London, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "Electricity in the Cotton Industry," by F. W. Cox and W. E. Swale.

4, Grosvenor Gardens, S.W.1. Iron and Steel Institute. Autumn meeting. (Continued on 11th November.)

MANCHESTER. — The University. A.S.E.E. National lecture, "The Industries and Supervising Engineers—Planning for Progress," by A. G. Ramsey.

RUGBY.—Electricity Showrooms, High Street, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Measurement of Light and Colour," by G. T. Winch.

SWANSEA.—Central Public Library, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Address by the chairman of the Western Centre, L. Burdes.

Friday, 11th November

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Chairman's address on "The Inventor and the State," by G. W. Tookey.

NEWCASTLE-ON-TYNE.—King's College, 7 p.m. I.E.E. North Eastern Students' Section. "A Review of Core Materials for Electrical Machinery," by L. C. Kerr.

NOTTINGHAM.—Spread Eagle Hotel, Goldsmith Street, 8 p.m. A.S.E.E. Nottingham Branch. "Control Gear," by P. C. Belton.

Saturday, 12th November

WAKEFIELD.—Association of Mining Electrical and Mechanical Engineers (Yorkshire North West Branch). Questions night.

Public Transport Association

The annual luncheon of the Public Transport Association will be held on 17th November at the Savoy Hotel, London when the chief guest will be Mr. A. Barnes Minister of Transport, who will propose the toast of the Association.

Commerce and Industry

Cable Makers' Christmas Arrangements
Union's "Go Slow" Threat

THE Joint Industrial Council for the Electrical Cable-Making Industry announces that in accordance with Clause 2(a) of the memorandum of agreement on payment for statutory holidays, it will be necessary in those establishments which observe the public holidays mentioned therein to select by local agreement an alternative day of paid holiday for Christmas Day. It should be noted that 26th December will be a statutory holiday and, in the event of 27th December being declared a public holiday, the Council recommends that wherever possible this day should be selected as the substituted day. At the meeting of the Council held on 19th October the following decisions were made in regard to payment for work done in the course of Christmas holidays: All time worked on Christmas Day, and on the day substituted for Christmas Day, to be paid for at the rate of double time; time worked on Boxing Day, to be paid for in accordance with the J.I.C. Agreement (Clauses 9(k), 10(k) and 11(h)), viz. time and half for day shift; time and four-fifths for night shift; and, in the case of double day shift or three shift systems, day time rate and a half for the first and second shifts with day time rate and four-fifths for the third shift.

Zinc Prices

The Ministry of Supply announces that from 28th October the price of good ordinary brand zinc has been increased by £2 from £81 10s to £83 10s per ton delivered. Prices for other grades will be increased accordingly.

The zinc oxide manufacturers announce that prices of zinc oxide are increased by £1 15s from 28th October. The new prices are: Red seal, £80 15s; green seal, £82 5s; white seal £83 5s.

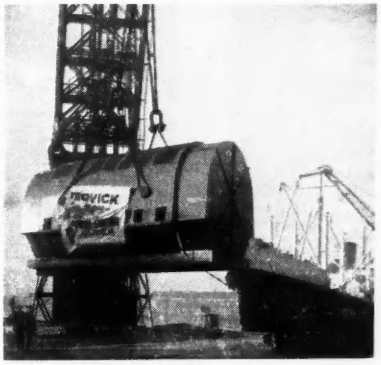
Constructors' "Work-to-Rule" Decision

The threat of members of the Constructional Engineering Union to work to rule after the refusal of employers to grant increased wages and extra "height" allowances was confirmed last week. The secretary of the Union stated that the executive committee had decided to advise members to adhere strictly to the building trades' safety regulations which had been largely ignored in the past in order to speed up the erection of buildings. All members had been given copies of the rules applying to steel erection. A ballot is being taken to decide whether the Union's claim should be submitted to the National Arbitration Tribunal and whether strike action should be taken if circumstances warrant it.

The Union's decision to work to rule will slow down the construction of a number of power stations and gasworks.

Stator for Pyrmont Station

The accompanying illustration shows the stator of the second 55,555 kVA, 33 kV, 3,000 r.p.m. "Metrovick" turbo-generator for Pyrmont "B" power station, Sydney,



Metrovick stator for Pyrmont power station being loaded aboard ship

Australia, at Liverpool being loaded aboard the s.s. *Sussex*. The first of the four machines ordered from the Metropolitan-Vickers Electrical Co., Ltd., by the Sydney County Council was despatched in March this year and is now in course of erection on site.

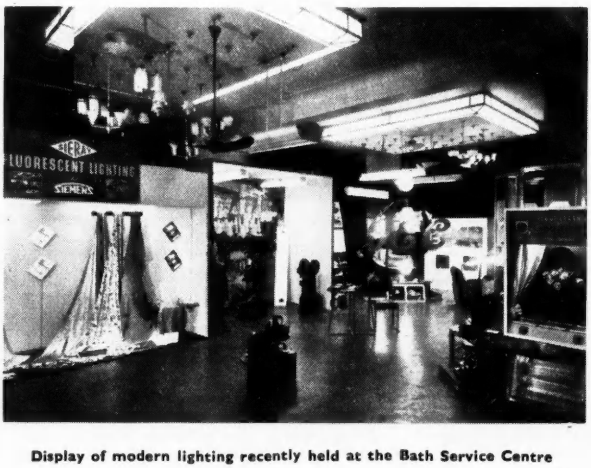
Theatre Lighting Demonstration

Representatives of the entertainment world throughout Lancashire saw a demonstration of the new "Atlas" dimmer-con-

trolled theatre lighting system at the Green Room Theatre, Manchester, on 20th October. The technicalties and economies of the system were explained by Dr. J. W. Strange, head of the Atlas research laboratories and Dr. H. H. Ballin, manager of the Lighting Division of Thorn Electrical Industries, Ltd.

Exhibition of Modern Lighting

More than 3,000 people attended a recent exhibition of modern lighting held at the Bath Service Centre of the South Western Electricity Board. Many of the exhibits were designed to encourage commercial consumers to take advantage during the coming winter months of the opportunities afforded, under the present lighting regulations, for shop window and general advertising lighting after 7 p.m. A secondary object was to make the general public "lighting conscious" by demonstrating the possibilities of modern lighting methods and advising on their correct use. The street lighting exhibits attracted the favourable attention of several local rural district and parish authorities, many of whose officials visited the exhibition. Other exhibits included displays of colour matching lighting, farm lighting, and a model illustrating applications of "black" lighting. Much of the display material was supplied by manufacturers of lighting equipment, and the exhibition was arranged and mounted by the Service Centre staff.



Display of modern lighting recently held at the Bath Service Centre

Packaging Exhibition

The first National Packaging Exhibition which concluded recently in Manchester, proved so successful that the organizers, Provincial Exhibitions, Ltd., have booked the Empire Hall, Olympia, London, for a second exhibition, which will be held from 8th to 18th November next year.

Industrial Supervisors

Over two hundred foremen and management executives from South Wales factories were present on 21st October when Councillor W. H. J. Muston, Deputy Lord Mayor of Cardiff, opened the inaugural meeting of the Cardiff Section of the Institute of Industrial Supervisors at the Technical College.

Mr. W. J. Williams, until recently Director of Education, who presided, commended education as a means to development and looked to foremen and supervisors in the area to initiate activities of benefit to themselves and industry.

The Section president, Dr. T. E. A. K. Jackson, head of the Department of Commerce and Administration, Cardiff Technical College, in his inaugural address referred to the vital position of industrial supervisors against the changing industrial background. The foreman and supervisor were in contact with the general body of workers and changes in social and industrial conditions had increased their responsibility for maintaining good relations at the productive level.

Mr. D. H. Bramley, a member of the Institute's Educational Advisory Panel welcomed the extension of the Institute's educational work into South Wales, and the general secretary, Mr. A. J. Mansell, outlined future plans for activities in South Wales.

"Electrician" Annual Tables

The 1949-50 edition of the "*Electrician*" Annual Tables of Electricity Undertakings of the World" has just been published by Benn Brothers, Ltd., Bouverie House, 154, Fleet Street, London, E.C.4, price 21s postage paid. In consequence of the nationalization of the electricity supply industry a rearrangement has been made so that the names of places in the United Kingdom appear in alphabetical order under the relative Boards, together with

the names and addresses of the appropriate Sub-Area and District managers, up-to-date tariffs and other details. Details concerning the Generating Divisions, their personnel, power stations and so on are published in a separate section which is indexed as an added convenience.

Considerable additions have also been made to the sections on Commonwealth and foreign undertakings, the overseas contacts which were broken during the war years having now been renewed.

Advertisement Lighting

The Ministry of Fuel and Power has issued a notice reminding consumers that the use of electricity, from the public supply, for advertisement lighting (including shop window lighting) is prohibited from 29th October until 2nd April, between 7 a.m. and 7 p.m. from Mondays to Fridays. There are no restrictions on Saturdays and Sundays.

C. A. Parsons Accounting System

An informative study of the application of punched cards to engineering by D. P. Walton, A.C.A., published by the British Tabulating Machine Co., Ltd., adds a new illustrated text-book to the accountant's library. The author makes a thorough survey of the work carried out by the punched card installation at the Newcastle-on-Tyne works of C. A. Parsons & Co., Ltd. He reviews the growth of the company which necessitated the overhaul of its accounting structure and the introduction of punched card automatic machines, to provide quick and accurate tabulations and analyses. The booklet includes specimen cards, and numerous tabulations assist the reader to follow the general routine and flow of work.

Copies of the publication can be obtained by executives of companies free of charge, from the British Tabulating Machine Co., Ltd., 17, Park Lane, London, W.1.

Mine Signalling Handbook

A well-produced 108-page booklet, which has just been published by the Automatic Telephone and Electric Co., Ltd., Strowger Works, Liverpool, 7, contains detailed descriptions of the full instructions for the installation and maintenance of complete signalling systems in mine shafts, staple shafts, and haulage ways. Mining telephones are also dealt with and the adjustments that may be necessary on this apparatus are recorded. It is emphasized that the book should be read in conjunction with the relevant Acts of Parliament and with the rules and regulations of the Ministry of Fuel and Power, in compliance with which the apparatus has been designed. The price of the book is 5s.

Appointments Register

A statement showing the number of vacancies outstanding on the books of the appointments offices of the Ministry of Labour, shows that at 12th September last there were 185 vacancies for electrical engineering executives. Of the 647 registrants, 470 were in employment.

Clothing Factory Lighting

The accompanying picture shows a lighting installation employing Benjamin "FF" "Fluroliers" in long continuous runs in the new modern clothing factory in Birkenhead of L. Harris & Co. With this installation no local lighting is required on the sewing machines, the fluorescent lighting providing illumination of over 40ft-candles. Each "Flurolier" has one 80 W 5ft lamp and is provided with top light by means of six slots on each sloping face of the reflector. The electrical contractors were Winstanley & Lambert.

Benjamin "Flurolier" installation in a clothing factory

S.W. Board Bristol Sub-Area

Mr. E. C. Willis, Bristol Sub-Area Manager of the South Western Electricity Board, with his deputies, Mr. E. A. Newburn and Mr. G. W. Richards, have taken up occupation of new permanent quarters at Electricity House, Bristol, the Board's head office.

The Electricity Board now rents the Dorset House, Clifton, property previously

occupied by the Bristol Sub-Area, but is hoping to purchase it with a view to using the garden space at the rear for building a 33kV distribution centre to give improved service to the Clifton area.

Export Targets

The following table, extracted from the *Board of Trade Journal*, shows the rate of export during the third quarter of this year of electrical goods and apparatus for which targets for the end of 1949 have been set, together with comparable figures for the first and second quarters.

MONTHLY RATES

Products	First Quarter 1949	Second Quarter 1949	Third Quarter 1949	Target End-1949
	£ million			
Wires and cables	2.20	2.19	2.09	2.20
Wireless apparatus and radar	1.04	1.02	0.99	1.32
Telephone and telegraph apparatus	1.25	1.26	1.38	1.40
Lighting apparatus	0.60	0.57	0.48	0.70
Batteries and accumulators...	0.40	0.43	0.40	0.38
Electro-medical apparatus ...	0.04	0.03	0.03	0.05
X-ray apparatus, etc.	0.08	0.05	0.07	0.12
Other products ...	1.25	1.21	0.96	1.33
Electrical machinery ...	3.45	3.35	3.32	2.85
Vacuum cleaners and other portable electrical appliances ...	0.27	0.31	0.22	0.24
Turbines and condensers ...	0.22	0.25	0.41	0.35

Clock Window Display Competition

Smiths English Clocks, Ltd., announces that photographs of windows for entry in its clock window dressing competition must arrive at the company's Advertising Department, 179, Great Portland Street, London, W.1, by 15th November.

Road Transport Restriction

The Minister of Transport has made an Order fixing the "Appointed Day" for the 25-mile restriction under Section 52 of the Transport Act, 1947, as February 1st, 1950. After this date it will be illegal for goods to be carried for hire or reward in a vehicle if the vehicle, at any time whilst the goods are being so carried, is more than 25 miles from its operating centre. This general provision is subject to certain exceptions, one of which relates to abnormal and indivisible loads carried in vehicles especially constructed therefor and apparatus or equipment ancillary to the operation carried in ordinary vehicles.

"Electrical Who's Who"

Those to whom we have sent questionnaires relating to our forthcoming "Electrical Who's Who" must return them within one week to ensure that their names are included.

Catalogues and Lists

Telegraph Construction and Maintenance Co., Ltd., 22, Old Broad Street, London, E.C.2.—Illustrated brochure describing the properties and applications of "Telcothene" insulating material in its various forms.

Brook Motors, Ltd., Empress Works, Huddersfield.—Brochure illustrating the use of Brook motors in the cotton industry.

Smith & Hobson, Ltd., 18-22, Kingston Hill, Kingston, Surrey.—Catalogue of instrument and small power transformers.

Dow-Mac (Products), Ltd., Tallington, Stamford, Lincs.—Technical brochure on pre-cast concrete poles.

Everett, Edgcumbe & Co., Ltd., Colindale Works, London, N.W.9.—Two technical folders on portable dynamometer wattmeters and photometric terms and measuring equipment.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Priced catalogue of the company's electric bakery equipment.

Thermega, Ltd., 51/53, Victoria Street, London, S.W.1.—Three priced folders on electrically heated blankets and pads.

R. B. Pullin & Co., Ltd., Phoenix Works, Great West Road, Brentford, Middlesex.—Three leaflets on precision multi-pole relays and low-voltage and mains-voltage instrument motors.

Kingston Lamp Co., Ltd., 6-10, New Cleveland Street, Hull. — Three posters advertising the company's lamps.

Trade Announcements

Mr. L. Wainwright, 88, Ridgeway Road, Sheffield, 2, has been appointed by **Grimston Electric Tools, Ltd.,** as its representative in the Midlands and Northern England.

Kolectric, Ltd., has opened a new sales office and showrooms at 73, Uxbridge Road, London, W.5, (telephone: Ealing 9096).

In order to cope with the increasing demand for their products **Londex, Ltd.,** 207, Anerley Road, London, S.E.20, have taken over premises close to the present works, which they are still retaining.

Australian Electrical Trade

During the nine months ended March last imports into Australia of electrical appli-

ances totalled £A12,313,000 in value, compared with £A6,837,000 during the corresponding period of 1947-48. The principal groups of imports are set out in the following table:

Class	Nine months of 1947-48 £A000	Nine months of 1948-1948 £A000
Batteries and accumulators...	55	101
Cable and wire, covered ...	950	2,704
Dynamo electric machines ...	1,510	2,734
Lamps, filament	293	413
Telegraph, telephone instruments, etc.	943	2,569
Other electrical appliances...	3,086	3,792

Exports of electrical appliances and equipment during the nine months totalled £A1,289,000 in value against £A841,000 in value during the corresponding period of 1947-48.

The current demand in Australia for domestic electric cookers is estimated at 25,000 yearly, of which 13,000 are as replacements and 12,000 for new dwellings. The total is just over double the pre-war figure.

In view of the big housing programme and extensive urban and rural electrification projects the market for cookers is expected to be well maintained. Imports of heating and cooking appliances into Australia in 1946-47 were valued at £A204,000.

"Solon" Export Folder

With a view to increasing the sales of its "Solon" electric soldering irons in overseas markets, W. T. Henley's Telegraph Works Co., Ltd., has issued an illustrated folder expressly designed for export trade. The text is in English, French and South American Spanish, the last language having been chosen in view of the need for increased earnings in hard currency areas, in which category most of the Latin-American countries are included. Space is provided on the back of the folder for the overprinting of the names and addresses of the company's overseas customers.

Changes of Name

Star Domestic Appliances, Ltd., of Manchester, has changed its name to Star Supplies (Domestic & Industrial), Ltd., as from 1st November.

Sussex Electrical Installations, Ltd., has changed its name to Carstens Electrical, Ltd.

Torbay Electric has changed its name to the Electric Meter Co.

Car Electrical Service (Faulkner), Ltd., has changed its name to Electrical Service (Faulkner), Ltd.

Consumers' Association

THE National Municipal Electricity Consumers' Association held its annual general meeting recently in Manchester. Councillor J. Selwyn-Jones, J.P., C.C. (chairman), who presided, surveyed the position of the electricity industry as it appeared to the local authority representatives. The Association, he said, had been in existence for nearly 13 years. It had done considerable good work in the past and from last year's experience it would undoubtedly continue to be the association through which local authorities would find expression directly on their many electricity problems.

The hon. secretary, Mr. A. J. C. De Renzi, reported on the work of the central office, and during a discussion the views were expressed that present delays in dealing with consumers' complaints and requirements in certain areas compared most unfavourably with the prompt and efficient service which characterized municipal control; that the present administration of the industry was top-heavy, and no real improvement could be expected until executive powers were delegated to district committees with a knowledge of the industry and the consumers' needs; and that district committees should be largely composed of local authority representatives.

The hon. secretary reported that he had received inquiries from large industrial users of electricity suggesting that they might be admitted to membership of the Association. It was agreed that a new class of associate members should be created.

Testing Protective Gear

ON Monday of last week Mr. P. W. Castle delivered his chairman's address to the London Students' Section of the Institution of Electrical Engineers and chose for his subject the "Testing of Power-System Protective Gear." The paper was presented in seven sections each of which dealt with one type of protective gear.

Mr. Castle first considered circulating-current protection for feeders or phase windings and subsequently as applied to a three-phase generator. He then proceeded to discuss methods of testing the protective gear for commissioning the equipment.

Earth leakage protection applied to transformer windings was then described, followed by Buchholz transformer protection and protective gear for distribution cables. In conclusion, Mr. Castle said that the efficient operation of protective gear was due to thoroughness in commissioning tests and regular fault routine maintenance testing. The latter should be performed not so much to prove operation but to discover incipient faults.

Electricity Supply

Power Plant Contracts : Proposed Flintshire Station

DURING the past month contracts have been placed by the British Electricity Authority for generating station, switching and transforming station and transmission equipment amounting in the aggregate to £1,445,940. The principal contracts include: Preliminary civil engineering works, Roosecote Marsh (Barrow) generating station (J. Gerrard & Sons, Ltd.); 66 kV main switchgear, Deptford East station, and 3.3 kV and 415 V switchgear, Plymouth "B" station (Metropolitan-Vickers Electrical Co., Ltd.); grit arresting plant, Brimsdown "B" station (Prat-Daniel (Stanmore), Ltd.); and 66 kV and auxiliary cables, Bankside station (British Insulated Callender's Cables, Ltd.).

Hydrogen-Cooled Generators

The first British hydrogen-cooled generator was put into service under normal operating conditions in the Littlebrook, Kent, power station of the B.E.A. South Eastern Division on 17th October. This generator of a

Hydrogen-cooled generator in position at Littlebrook station

60 MW (75 MVA) 3,000 r.p.m. turbo-set is the first of two supplied by the Metropolitan-Vickers Electrical Co., Ltd., and the first of the type to be completed in this country. The first machine was demonstrated on full kVA tests with hydrogen cooling at the makers' works in June, 1948 (*Electrical Review*, 11th June, 1948) and its erection was completed some time ago. The set has recently been operating with the generator air-cooled until enough steam became available for a sufficient load to make hydrogen cooling economical. The second set was delivered in July of this year.

Connah's Quay Station

The B.E.A. has applied to the Minister of Fuel and Power for consent to the construction of a new station, designed for an ultimate capacity of 180 MW, on a site of about 200 acres at Connah's Quay, Flints. The initial installation will comprise two 30 MW turbo-alternators, two 300,000 lb/hr boilers and a reinforced concrete cooling tower.

Transmission Line Transfer

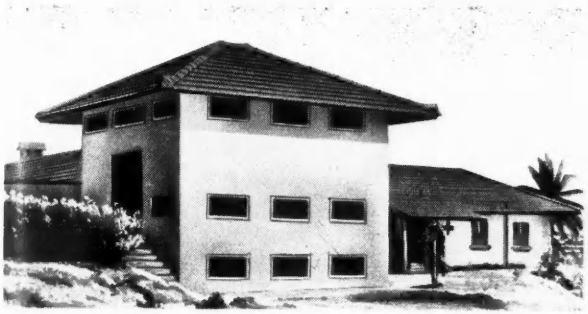
The Minister of Fuel and Power and the Secretary of State for Scotland have made the Electricity (Dundee-Abernethy Transmission) (Transfer) Order, 1949. This Order transfers the main transmission line between Dundee and Abernethy, and the substations at those places, from the B.E.A. to the North of Scotland Hydro-Electric Board.

Conditions in Singapore

The state of emergency declared in the colony of Singapore last year had no direct effect on the working of the Electricity Department, states Mr. C. C. Payne, municipal electrical engineer, in his annual report for 1948. There were, however, many other difficulties with which the department had to contend, mainly as a result of the deplorable condition of plant and equipment following the Japanese occupation. Because of the poor response to appeals for economy, it was necessary to renew the proclamation

issued by the British Military Administration for the restriction of supply.

In 1946 the Commissioners placed an order for a 25 MW turbo-alternator and two



Typical suburban substation of the Singapore Electricity Department

187,000 lb boilers, and last year tenders were invited for a further similar set and boilers. The plant is to be installed in a new power station, with an ultimate capacity of 150 MW, on a site of 37 acres at Pasir Panjang, where it will be possible to build the undertaking's own wharf and pier. Planning was also commenced on a new 66 and 22 kV system to transmit the power from the new station to the town and other sections of the island. During 1948 sales increased by 22 per cent to 104.4 million kWh, and the number of consumers rose by 2,065 to 36,947.

Lighting Plans

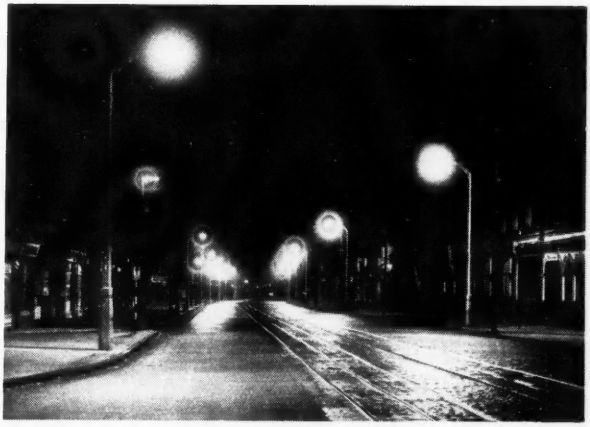
Kingston-on-Thames reports the receipt of Ministry of Transport authorization for the installation of new mercury discharge lighting in the town centre, at an estimated cost of £4,527. The chairman of the Highways Committee has stated that while it is most desirable that the existing mercury discharge lighting should be continued along the remaining portion of London Road, Richmond Road, Eden Street and High Street, so as to make such lighting continuous from the borough boundaries, he would like further consideration to be given to the installation of this type of lighting in Clarence Street, Market Place, Thames Street and Church Street. A special subcommittee has been set up with power to accept a suitable tender for the installation of mercury discharge lighting in the roads referred to by the chairman at a total estimated cost of £2,600.

Scunthorpe (Lincs) has also decided to adopt mercury discharge lamps for street lighting at a cost of £11,000. At present there are three types of street lighting in use.

It is estimated that the change-over will take three years to complete.

Sixty Years After

In 1889 a generating plant was established by Mr. W. Beale in Holloway Road, Islington, to supply a new restaurant and ban-



"Mazda" mercury vapour lighting installed in Holloway Road, Islington

queting hall, and this building was the first in the borough to be illuminated by electricity. Later the Holloway Electric Supply Co., Ltd., was formed by Mr. Beale, and an agreement was entered into with the Islington Vestry for the provision of electric lighting in part of Holloway Road. It was particularly appropriate, therefore, that be-

fore a modern system of lighting was officially inaugurated last week by the Mayor of Islington (Ald. H. J. L. Lygoe, J.P.), the guests, who included representatives of the Ministry of Transport, New Scotland Yard, the London and Eastern Electricity Boards, and neighbouring local authorities, met in Beale's Restaurant, where they were welcomed by Mr. V. C. H. Creer on behalf of the British Thomson-Houston Co., Ltd., which planned and carried out the new installation in collaboration with Mr. C. N. Cowney, borough engineer of Islington.

The new lighting system comprises 58 "Mazda" horizontal enclosed lanterns housing 400 W mercury vapour lamps and mounted at 25ft on concrete columns and trolley-pole extension brackets in staggered and double-staggered formation at 150ft spacing. Stanton spun concrete columns are employed from Highbury Place to Holloway Road railway bridge, and Concrete Utilities columns from there to Camden Road. Under the railway bridge, mounted on wall-brackets, there are eight "Mazda Dilen Junior" units, and on the bridge itself two "Rural Enclosed" lanterns, all housing 125 W mercury lamps.

South African Scheme

In the recent annual report of the South African Electricity Supply Commission the list of new power schemes to be carried out included the construction of a station at Worcester, Cape Province, to be known as the Hex River station. We have now received from the chairman of the Commission, Mr. A. M. Jacobs, the accompanying photograph taken about a month ago showing the progress of construction, which is in some respects ahead of schedule. The new station is required to supply the northern area of the Cape system, as well as to provide power for the electrification of the railway main line from Bellville to Towns River. It is planned to have three 20 MW turbo-alternators and four 200,000 lb/hr boilers in commission during 1952, the initial installation being estimated to cost £3,600,000. A further two 20 MW sets and three boilers are to be added later.

Turbine house of Hex River Station in course of erection

Shoreditch Coat of Arms

A carved coat of arms of the borough of Shoreditch, which was previously in the committee room of the Electricity Department's offices in Hoxton Street and has now been fixed in the conference room of the town hall, was last week formally handed over to the Council by the London Electricity Board, into whose ownership the carving had passed on nationalization of the industry. Mr. R. H. Rawll, former borough electrical engineer and manager of Shoreditch and now commercial officer of the Northern Sub-Area of the London Board, referred to the fact that the arms incorporated the appropriate motto, "More Light, More Power." This was adopted in 1897, the year of the inauguration of the electricity undertaking, when Shoreditch was the first district in England to utilize the heat generated by burning its refuse for the production of electricity. Mr. G. J. Moody, manager of the Northern Sub-Area, handed over the coat of arms to the Mayor (Alderman R. G. Linale, J.P.). Councillor Mrs. D. Thurtle, J.P., Leader of the Council, and Councillor W. Hebden, J.P., chairman of the Electricity Committee for many years, also spoke.

Load Spreading Appeal

The South Western Electricity Board has arranged to distribute leaflets to each individual consumer in the Area explaining why and when they should "go easy" with their use of electricity. Posters are also being displayed in service centres and wherever possible on outdoor sub-station sites.

Simplification in Industry

REPORT ON AN AMERICAN TOUR

LAST July, under the auspices of the Anglo-American Council on Productivity, a party of leading British industrialists visited the United States to investigate and report on methods employed in American industry to limit the diversity of types and ranges of products and their effect upon productivity and cost, and to consider and recommend how far experience in this matter could be advantageously applied in the United Kingdom. The leader of the group was Maj-Gen. J. S. Crawford (Guy Motors, Ltd.) and the members were Messrs. C. A. Martin (consulting engineer, British Thomson-Houston Co.), R. Neill (director, Joseph Lucas (Electrical), Ltd.), G. Weston (assistant director, British Standards Institution), B. White (technical director, Federation of British Industries), and C. J. A. Whitehouse (secretary, M.o.S. Committee on Standardization).

In its report, published this week, it is stated that the party had discussions with a number of American professional and trade bodies, including the National Electrical Manufacturers' Association, the Radio Manufacturers' Association, the Duquesne Light Co. and the Westinghouse Electric & Manufacturing Co. Meetings were also held with representatives of a number of companies, and in some cases visits were paid to their works. Among them were the General Electric Co., Schenectady, N.Y., the General Motors Corporation (Electromotive Division), the Weston Electrical Instrument Corporation, the Radio Corporation of America and Leeds & Northrup.

Contribution of Technical Press

In the course of a brief historical survey the report refers to the setting up of the Division of Simplified Practice within the National Bureau of Standards and the influence of this upon American industry. It is said that the technical and trade Press by publishing information bearing upon high productivity and low cost has had a considerable effect upon the position. The Press is aided by the willingness of manufacturers to have their work and its results fully publicized.

Mention is made of the American Standards Association and other agencies which participate in the work of simplifying practice, including the National Electrical Manufacturers' Association, which has been active in the standardization of switchgear, transformers, etc., and also of ball bearings.

Cost Increases Offset

Examples of simplification in a number of industries are quoted, among them that of a radio and television set manufacturer. One of the largest diesel-electric locomotive factories is said to have counteracted increased costs between 1939 and 1945 by savings in the production line and to have kept down a subsequent price increase to 25 per cent, although material costs alone had risen by 110 per cent.

At the main plant of one of the largest electrical manufacturing groups it was found that a central organization was maintained for encouraging and organizing simplification and standardization with great effect. The reduction of the number of types of electric iron made from 19 to four, using only two types of sole-plate, thermostat and shell had enabled the company to keep the increase in price down to only 14 per cent above the pre-war level in spite of doubled material costs and labour rates two-thirds more. The range of electric fans had been reduced from 250 to some 50 and a further reduction was intended, reducing direct labour costs by a half and indirect labour costs by two-thirds.

It was found that there was greater specialization in the United States than in this country. Where a manufacturer found that he could buy a component outside more cheaply than he could make it he was ready to cease producing it himself. Specialists approached firms with "propositions" of this kind and collaboration between the manufacturers and specialists was very close. Education of the customer to take simplified lines was

considered important, and differential prices were employed to discourage the demand for "specials."

It was found that by "hard selling" of the advantages of simplification American manufacturers were successful in selling the home product abroad. The party found that the Americans were enthusiastic in their search for means of increasing production and lowering the costs and that they were more ready to share their technical knowledge and discuss production methods than their British counterparts.

Among the recommendations made is that an immediate campaign should be launched in every industry in which a policy of simplification can be applied. The trade associations are the most suitable bodies to conduct these campaigns. There should first be a survey to ascertain the extent to which effort is being dissipated and thus discover the possibilities of simplification. The benefits of simplification should be impressed on management and workers, and the exchange of information on the subject should be encouraged. Stress should be laid on the results achieved. It is considered that these matters should be the responsibility of a senior officer in each association, specially appointed if necessary.

Individual firms are recommended to make a close study of the possibilities of simplification and take all possible action to reduce unnecessary variety. They should also encourage consumers to want simplified products by sales techniques and by imposing the proper overhead charge on special or non-standard orders. Consideration should be given to the possibility of closer collaboration with outside specialist producers and suppliers of components, stores and materials, in order to make the utmost use of long-run low-cost capacity and simplified and standardized materials.

The report ("Simplification in Industry") is available from the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1 (price 1s).

E.D.A. Educational Films

A THIRD series of educational films is now in course of preparation by the British Electrical Development Association. It will consist of seven films, four of which have already been completed. Dealing with the fundamentals of electricity in relation to movement and heat, the films will provide a useful introduction to the two previous series of films.

The first of the completed films ("What is Electricity?") mentions the outstanding discoveries which led to the development and use of electricity, indicates the conception of matter as composed of atoms each consisting of a nucleus and revolving electrons, and leads to the idea of electricity as being a movement of electrons. "Electricity and Movement" starts with a simple toy horseshoe picking up tacks. Then an electromagnet is shown first working an electric bell and then adapted to turn an axle and so by progressive steps developed into a simple electric motor.

"Putting Free Electrons to Work" shows how electrons can be made to leave the surface of a conductor and gives a simple explanation of the diode and triode valves and their uses. The fourth film, "Alternating Current and Direct Current," gives an outline of the difference between a.c. and d.c., why a.c. is in general use, how d.c. can be produced from a.c., and the reasons why one or the other is used for particular purposes.

The three other films, which will be ready in about a month, deal with "Electricity and Heat," "Electro-Chemistry," and "High-Frequency Heating." Each of the films lasts about ten minutes and is available in both 16 mm and 35 mm sizes on free loan to responsible organizations on application to the general manager and secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2.

I.E.E. Students' Dance

THERE was a record attendance at the autumn dance held by the London Students' Section of the I.E.E. last Saturday at the North Hall, Bloomsbury Halls, London, W.C.1. Over 200 double tickets were sold, and the 400 or so members and their guests spent a most enjoyable evening dancing to the music of Chris Stone's band. A special effort was made by Mr. J. K. Langham, the Section entertainments officer, who organized the dance, to make it a little less formal than similar functions which have been held in the past.

Mr. A. H. Willoughby, a member of the committee, acted as M.C. The chairman, Mr. P. W. Castle, welcomed the guests and Mrs. Castle presented prizes to the winners of the spot and elimination dances.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

Telephone Properties, Ltd.—Speaking at the annual meeting held on 25th October, Sir Alexander Roger (chairman) said that the Nacional Co., Venezuela, in which they had such a large interest, had suffered during the war from its inability to secure the material it required. Since 1946, however, considerable leeway had been made up, and for the three years ended 31st December, 1948, £525,000 of telephone material had been shipped from Great Britain for the Nacional Co. This had enabled it to add 13,185 stations to its system, bringing the total at the end of 1948 to 52,618. The waiting list was 20,000. The negotiations between the Nacional Co., and the Venezuelan Government for an increase in tariffs to meet increased costs had resulted in a revised tariff structure which became effective as from mid-April, 1949.

The Bagdad Light & Power Co., Ltd., held its annual meeting on 26th October, when Sir Kinahan Cornwallis (chairman), who presided, said that the maximum demand had increased from 9,500 kW in 1947 to 11,750 kW in 1948. They were doing everything they could to expedite the placing in commission of the 12,500 kW turbo-generator set ordered in 1946. Erection was well advanced, but completion was hampered by certain supply difficulties. It was hoped, however, that it would be in commission about the end of this year. Orders for a second 12,500 kW set had been finally confirmed. The Iraq Government had fixed the date of its option to purchase the undertaking at 31st December, 1954, subject to one year's previous notice. The subsequent five-yearly periods at the expiration of which the Government would have the option to purchase would be calculated from that date. The company, despite rising costs, had agreed to reduce the maximum selling price from 20 to 18 fils per kWh with effect on bills for electricity supplied in April, 1949.

Sterling Electric Holdings, Ltd.—The annual meeting was held on 31st October. Sir Albert N. Braithwaite (chairman) presiding. In his statement, which was issued with the report and accounts, the chairman says that home sales have been seriously affected by the reduction in purchasing power of the public, and the reluctance of retailers to hold stocks of goods carrying purchase tax. The export sales have continued to expand and have compensated to some degree for the decrease in home sales. The combined turnover for the year showed an increase, as compared with the previous year, due to the substantial increase in the diesel engine production and sales, and to the expansion of the export sales of electrical equipment.

The British Electric Traction Co., Ltd., has received Treasury consent to the capitalization of £1,581,504 of reserves, and it is proposed to distribute a capital bonus to deferred stockholders in the form of deferred ordinary stock in the ratio of £2 of the new stock for each £1 of deferred stock now held. The amount of the proposed distribution is approximately equal to the capital surpluses which have accrued or are estimated to accrue to the company as a result of the compulsory acquisition of the group's electricity supply and gas undertakings. The new stock, which will be designated "A" deferred ordinary stock, will not confer any voting rights, but in all other respects will rank *pari passu* with the existing deferred ordinary stock. The proposals will be submitted at an extraordinary meeting to be held on 15th December.

The Chloride Electrical Storage Co., Ltd., proposes to increase its capital from £1,250,000 to £2,500,000 and to capitalize part of the accumulated reserves. The Capital Issues Committee has consented to an issue of £791,100 "A" and £297,603 "B" ordinary stock by way of capitalization of reserves, so that £1 of additional ordinary stock may be issued for each £1 existing ordinary stock; new "A" and "B" ordinary stock being issued respectively to the holders of existing "A" and "B" ordinary stock. An extraordinary meeting to consider resolutions to the above effect will be held on 30th November.

Ward & Goldstone, Ltd., are holding an extraordinary meeting on 22nd November to consider resolutions that the 20,000 unissued preference shares of £1 each be sub-divided into four shares of 5s each, and that the 80,000 preference shares resulting from the sub-division be converted into ordinary shares. Also that £23,575 from general reserve be capitalized and applied to paying up in full 94,300 of the unissued ordinary shares of 5s each, to be allotted (subject to the condition that they do not rank for any

dividend declared before the next annual meeting of the company) to stockholders in the proportion of one 5s share for each £1 of ordinary stock held. The new ordinary shares issued will be converted into ordinary stock.

This capitalization does not require the approval of the Capital Issues Committee as the Statutory Order allowing such transactions below £50,000 remains in force, and is not affected by the suspension by the Committee of sanction to bonus issues.

The company has declared an unchanged interim dividend of 20 per cent.

Falk, Stadelmann & Co., Ltd., report a consolidated profit for the year ended 31st March last of £501,464, as compared with £491,248 for the preceding year, to which is added income from investments of £1,528, interest on war damage value payments £13,950, and profit on sale of investments £2,437, making a total of £519,379. After providing £236,024 for taxation, and deducting directors' and local directors' remuneration in Britain and abroad, depreciation, etc., there is a net profit of £149,390 (against £157,830). The distribution on the ordinary shares is maintained at 15 per cent for the year, and after making various allocations a balance of £231,778 is carried forward (against £175,402 brought in).

Electric & Musical Industries, Ltd., in a preliminary statement, shows a consolidated net profit for the year ended 30th June last of £346,720, as compared with £498,192 for the previous year. The ordinary dividend for the year is 6 per cent with a bonus of 2 per cent, both less tax (unchanged).

Bennis Combustion, Ltd., reports a net profit of the company and its subsidiary, after tax, for the year ended 30th April last of £68,420, as compared with £22,030 for the preceding year. The final dividend is 10 per cent (against 7½ per cent), making 15 per cent (against 12½ per cent) for the year.

The Anglo-Portuguese Telephone Co., Ltd., has declared an unchanged interim dividend of 3 per cent.

The Metropolitan Electric Cable & Construction Co. Ltd., has declared an interim dividend of 10 per cent (unchanged).

New Companies

Allcock & Hewitt, Ltd.—Registered 19th October. Capital £3,000. Electrical and wireless engineers, etc. Directors: J. H. Allcock and D. F. Hewitt. Regd. office: 4/6, Thayers Farm Road, Beckenham, Kent.

Electrical Services (Shears), Ltd.—Registered 29th September. Capital £3,000. Electrical contractors and engineers, radio, ventilating and refrigerating engineers, etc. Directors: H. H. Shears and Mrs. Gwendoline Shears. Regd. office: Hinton Buildings, Hinton Road, Bournemouth.

Baird (Electrical Appliances), Ltd.—Registered in Edinburgh, 29th September. Capital £100. Importers, exporters, traders, dealers in electrical appliances and accessories, etc. Directors: W. Baird and Christine Baird. Regd. office: 29, St. Vincent Place, Glasgow, C.1.

Jones Tate & Co., Ltd.—Registered 30th September. Capital £30,000. Electrical, mechanical, manufacturing and distributing engineers, founders, smiths, machinists, and patentees, workers and dealers in electrical and mechanical apparatus, etc. Directors: C. E. Jones and M. D. Jones. Regd. office: Victory Works, East Parade, Bradford.

Leslie Smith (Radio), Ltd.—Registered 30th September. Capital £1,000. To acquire the business of an electrical and radio retailer and dealers carried on by L. Smith at Birmingham. Directors: L. G. F. Smith, Mrs. Joan M. Smith and Mavis D. Blick. Regd. office: 12, Spring Hill, Birmingham.

Safflex, Ltd.—Registered 26th October. Capital £100. Manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, dynamos, etc. F. Vogl is first director. Regd. office: 1, Quality Court, Chancery Lane, W.C.2.

Electrand (Scientific Instruments), Ltd.—Registered 26th October. Capital £500. Scientific instrument and electrical apparatus manufacturers, etc. P. Frost-Smith is the first director. Regd. office: Pengarreg, Ystrad Meurig, Cardiganshire.

Liquidations

Kirby Hill Electric, Ltd.—Winding up voluntarily. Liquidator, Mr. W Le'R. Hand, Fletcher's Chambers, Fore Street, Birmingham, 2.

H. Lawrence Electrical, Ltd.—Winding up voluntarily. Liquidator, Mr. H. S. Thompson, St. Stephen's Chambers, Telegraph Street, Moorgate, London, E.C.2.

The Becall Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. F. A. Perigo, "Maderia," Heol-y-Gors, Philog, Cardiff.

Bankruptcies

J. V. Figgins, 3, Pottery Terrace, Alexandra Road, Newport, Mon., electrical engineer.—Last day for receiving proofs for dividend 9th November. Trustee, Mr. R. Betts, 34, Park Place, Cardiff. Official Receiver.

L. M. Watts, Cucumber Lane, Brundall, Norfolk, radio and electrical engineer.—First and final dividend of 3s 10d in the £, payable 2nd November at the Official Receiver's office, Castle Chambers, Opie Street, Norwich.

FINANCIAL SECTION
STOCKS and SHARES

STOCK Exchange markets continue in a state of uncertainty and restlessness. Opinions differ as to when the next General Election will take place. If it should come this year, there is a vague impression that this would have the effect of putting Stock Exchange prices higher, at all events for the time being, and, assuming, of course, that the present Government were to be defeated. If nothing happens this year, the present sagging tendency in gilt-edged stocks is thought likely to continue.

In themselves, the Government proposals to take £25 million off long-term fuel and power projects as a contribution towards the cut in capital investment have not carried much weight in the market for electrical equipment shares. Lack of confidence in the economic prospect as a whole has resulted in mild depression among industrial shares; but, once again, the leaders are acting with a restraint which contrasts markedly with the weakness of Government securities. Yields on these two classes of investment are coming, as a result, closer together. On War Loan, the yield of 3.9 per cent compares with 4.2 per cent on A.E.I. ordinary. Apart from the leaders, however, the field is becoming more spread-eagled, as our list of prices testifies.

Joseph Lucas Capital

British Electric Traction, Joseph Lucas and Chloride Electrical Storage were among the last companies to receive permission for free bonus-share issues before the Chancellor's new ban came into operation. These three companies, like many before them, take pains in accompanying statements to avoid any wrong interpretation. The object of Lucas's 200 per cent bonus, involving a sum of over £4 million, is to enable reserves, built up over many years, to be consolidated into permanent capital; capacity and turnover have multiplied since the last capital increase; profit and loss account, it is emphasized, is not affected, and, other things being equal, the next distribution per share will be one-third the last corresponding payment on the present capital.

B.E.T.'s Bonus

Like J. Lucas, British Electric Traction is capitalizing, by a 200 per cent bonus issue to deferred stockholders, an accumulation of reserves and undistributed profits which have been ploughed back for years into the business. They have reached substantial proportions since 1939, when the company had to suspend its regular and popular practice of making these distributions. The amount of about £1½ million involved on this occasion is approximately equal to the capital surpluses arising from the acquisition of the group's electricity and gas undertakings. In order to preserve the balance of voting power between all classes of capital, the newly issued stock (to be called "A" deferred) will carry no voting rights.

More Bonus Issues

Chloride Electric's 100 per cent bonus to "A" and "B" shareholders means the capitalization of over £1 million reserves. Allen West & Co., hold a meeting on 15th November to approve proposals for distribution of three bonus 5s shares for every 25s stock: that is, 3 new shares for 5 shares now held. Ward & Goldstone propose to capitalize £23,500 into 5s shares to be given to shareholders in the proportion of one new share for every £1 of ordinary stock held.

Falk, Stadelmann

This company's accounts, together with the chairman's review, reveal that a moderate decrease in profits resulted last year from a decline in home sales. Total sales were, nevertheless, well maintained, thanks to bigger export business. Net profit of the group, after taxation and increased depreciation charges, comes out just short of £150,000, against £158,000 previously. This leaves group earnings of over 40 per cent to cover the maintenance of the distribution at 15 per cent, of which 5 per cent is declared as bonus. With the aid of a strong balance sheet, this year's business was financed out of the company's resources. The £1 shares are quoted at 37s 6d to yield 8 per cent.

E.M.I. Results

Electric & Musical Industries 10s shares, now standing at 14s 6d, were not unduly perturbed by the decline reported in the preliminary profits statement covering the year to last June. The group profit of £346,700 is about £150,000 down on the previous year's This accords roughly with market expectations formed since the company's cautious view of prospects at the time of the preference share issue early in the year. Taking a large proportion, this time, of the subsidiaries' earnings, the parent company's net profit is £206,250, which covers amply the distribution, as before, of 6 per cent dividend and 2 per cent bonus.

Electrical Investments

Past Month's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 31 Oct. 1949	Month's Rise or Fall	Yield £ s. d.
Overseas Electricity Companies					
Atlas Elec.... ...	2	2½	12/9	—9d.	3 18 6
Calcutta Elec. ...	6†	6†	21/6	—	4 18 0
Cawnpore Elec. ...	13	10	40/–	+$\frac{3}{16}$	5 0 0
East African Power	7	7	33/3	–$\frac{3}{8}$	4 4 2
Jerusalem Elec. ...	5	6	17/–	—	—
Madras Elec. ...	8	5	30/–	—	3 6 8
Nigerian Elec. ...	12½	10	35/–	—	—
Palestine Elec. "A"	7†	Nil	28/6	—	—
Perak Hydro-Elec.	Nil	Nil	11/–	–1	—
Whitehall Inv. Pref.	—	6	23/–	—	5 4 4
Equipment and Manufacturing					
Aberdare Cables ...	10	15	55/–	—	5 9 1
Aron Elec. Ord. ...	15	15	37/6	–$\frac{1}{2}$	8 0 0
Assoc. Elec. Ord. ...	15	15	71/6	–4/–	4 4 0
Automatic Tel & El.	12½	12½	51/3	+$\frac{1}{2}$	4 17 8
Babcock & Wilcox	15	15	60/–	–2/–	5 0 0
Baldwin, H. J. (2/–)	25	25	5/9	—	8 14 0
British Aluminium	10	10	40/–	–2/3	5 0 0
B.I. Callender's ...	6⅝	6⅝	31/–	—	4 6 0
British Thermostat (5/–)	23½	25	23/9	—	5 5 3
British Vac. Cleaner (5/–)	20	20	8/6	–6d.	11 15 4
Brush Ord. (5/–) ...	—	10	5/9	–9d.	8 13 10
Burco (5/–) ...	35	35	19/6	–6d.	8 19 6
Chloride El. Storage	20	20	90/–	–$\frac{1}{2}$	4 9 0
Cole, E. K. (5/–) ...	22½	20	11/3	–9d.	8 17 10
Cossor, A. C. (5/–) ...	Nil	Nil	6/6	–1/–	—
Crabtree (10/–) ...	17½	17½	33/6	—	5 4 6
Crompton Parkinson Ord. (5/–) ...	22½	22½	22/6	–2/–	5 0 0
De La Rue (5/–) ...	50	50	21/3	–$\frac{1}{2}$	11 15 4
Decca (1/–)... ...	112½	112½	13/–	–/–	8 13 0
E.M.I. (10/–) ...	6	8	14/9	1/6	5 9 6
Electrical Components (5/–) ...	20	20	10/9	—	9 6 0
Elec. Construction	12½	12½	48/3	–$\frac{1}{2}$	5 3 9
Enfield Cable Ord.	7½	7½	27/0	–1/9	5 11 1
English Electric ...	10	10	45/–	–1/6	4 9 0
Ericsson Tel. (5/–)...	20†	20†	39/6	–$\frac{1}{16}$	2 10 8
Ever Ready (5/–) ...	40	40	27/–	–2/–	7 8 2
Falk Stadelmann ...	15	15	37/6	–$\frac{1}{16}$	8 0 0
G.E.C. Ord. ...	17½	17½	73/6	–6/–	4 15 1
General Cables (5/–)	50	50	18/9	—	—
Greenwood & Batley	15	15	41/3	–5/–	7 5 0
Hackbridge Cable (5/–)	—	20	12/3	–$\frac{1}{16}$	8 3 4
Hackbridge Hewittic (5/–)	12	12½	11/0	–6d.	5 13 8
Hall Tel. Acc. (10/–)	10	10	13/0	–6d.	7 13 10
Heatrae (2/–) ...	12½	12½	4/–	—	6 5 0
Henleys (5/–) ...	20	20	22/6	–1/6	4 9 0
Hoover (5/–) ...	40	40	32/6	—	6 3 0
Intl. Combustion (5/–)	37½	37½	17/6	–2/–	—
Johnson & Phillips	15	15	59/6	–3/–	5 0 8
Equipment and Manufacturing (continued)					
Lancashire Dynamo	22½	22½	91/3	–$\frac{5}{16}$	4 18 9
Laurence, Scott(5/–)	12½	12½	12/6	—	5 0 0
London Elec. Wire	10	10	45/–	—	4 9 0
J. Lucas	17½	17½	78/9	–$\frac{1}{2}$	4 8 10
Mather & Platt ...	11	11	47/–	–3/–	4 13 7
Metal Industries ...	10	10	41/3	–$\frac{1}{16}$	4 17 0
Mid. Elec. Mfg. ...	35	35	53/–	—	—
Murex	20	20	45/–	—	4 9 0
Newman Ind. (2/–)	22½	17½	3/6	+6d.	—
Oldham & Son (1/–)	60	60	5/–	—	6 0 0
Plessey (5/–) ...	20	20	13/9	—	7 5 5
Parsons C. A. ...	12½	12½	60/–	–$\frac{1}{16}$	4 3 4
Pye Deferred (5/–)...	25	25	27/6	–2/–	4 11 0
Radio & Tel. (2/–)	Nil	25	2/–	—	—
Revo (10/–) ...	27½	27½	46/3	–$\frac{1}{8}$	5 19 0
Reyrolle	12½	12½	59/6	–$\frac{1}{16}$	4 5 7
Scophony Baird (1/–)	—	—	3/–	—	—
Scot. Cable (4/–) ...	30	30	27/–	+1/–	5 9 0
Siemens Ord. ...	7½	7½	30/–	–$\frac{1}{16}$	5 0 0
Switchgear & Cowans (5/–)	20	20	13/–	+1–	7 14 0
T.C.C. (10/–) ...	15	15	32/6	—	4 12 4
T.C. & M.	10	10	38/3	–$\frac{3}{16}$	—
Telephone Mfg. (5/–)	9	9	8/6	—	5 6 0
Thorn Elec. (5/–) ...	25	20	15/–	–$\frac{1}{16}$	6 13 4
Tube Investments...	25	25	5½	–¼	4 11 0
Vactric (5/–) ...	Nil	Nil	8/9	–3/3	—
Veritys (5/–) ...	5	5	2/9	—	9 1 10
Walsall Conduits (4/–)	70	70	53/9	–$\frac{1}{2}$	5 4 1
Ward & Goldstone (5/–)	50	50	48/6	+1/–	5 3 1
Watford (2/–) ...	15	20	6/6	—	6 3 1
Westinghouse Brake	14	14	63/3	–6d.	4 8 7
West, Allen (5/–) ...	10	10	12/–	—	4 3 4
Transport and Communications					
Anglo-Am. Tel.: Pref.	6	5$\frac{5}{20}$	102½	–2½	—
Def.	1½	1½*	12½	—	—
Anglo-Portuguese...	8	8	25/6	–1/6	6 5 6
Brit. Elec. Traction: Def. ord. ...	50	50	152/5	–20	3 5 0
Calcutta Trams ...	Nil	6†	28/6	+2/9	4 4 3
Cape Elec. Trams ...	6	6	26/–	—	4 12 4
Cable & Wireless: 5½ Pref. ...	5½	5½	107	+2	5 2 10
Ord.	4	4	236½	–3½	—
Globe Tel. & Tel. Ord.	5†	5†	43/9	+$\frac{1}{16}$	2 5 8
Great Northern Tel. (£10)	12	7	12½	+½	5 12 6
Inter. Tel. & Tel. ...	Nil	Nil	19	—	—
Marconi Marine ...	7½	7½	25/–	—	6 0 0
Oriental Tel. Ord. ...	10	16	47/6	+2/3	6 15 0
Telephone Props ...	6	6	13/9	–9d.	8 14 6
Tele. Rentals (5/–)...	10	10	9/6	+3d.	5 5 3

*Dividend postponed.

†Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

4565. British Thomson-Houston Co., Ltd. (General Electric Co.).—Resistance regulators. 23rd February, 1945. (630366.)

5452. General Electric Co., Ltd., Nelson, E. H., and Power, E. B.—Electric-discharge lamps. 5th March, 1945. (630547.)

14379. Babcock & Wilcox Co.—Fluid-heating. 4th July, 1944. (630549.)

15186. Williams, F. C.—Wireless signalling systems. 14th June, 1945. (630367.)

19336. Baker, W. A., Sharpe, C., Hopkinson, K., Bradfield, G., and Tutchings, A.—Cathode-ray oscillograph apparatus. 27th July, 1945. (630552.)

22478. British Thomson-Houston Co., Ltd., and Griffiths, L.—Electric snap action switches. 31st August, 1945. (630425.)

22879. British Thomson-Houston Co., Ltd.—Electric protective devices. 9th September, 1944. (630553.)

1946

1030. General Electric Co., Ltd., and Friedlander, E.—Three-phase feeder protective systems. 11th January, 1946. (630557.)

7862. Philips Lamps, Ltd.—Electric resistances. 16th March, 1945. (630307.)

7929. Marconi's Wireless Telegraph Co., Ltd.—Generators of electrical oscillations. 14th March, 1945. (630308.)

10881. Liquidometer Corporation.—Electrical devices. 2nd October, 1945. (630486.)

14023. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Hot-gas engines. 30th October, 1941. (630428.)

14979. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Hot-gas engines. 12th November, 1941. (630429.)

15389. Hofgaard, R.—Electrical computing apparatus. 21st May, 1946. (630559.)

15819. Standard Telephones & Cables, Ltd.—Workholder for glass-working lathe. 28th May, 1945. (630309.)

18603. McIver, P. E.—Light sensitive apparatus. 16th July, 1945. (630490.)

19460. Brush Development Co.—Magnetic recording medium and methods for making the same. 30th August, 1945. (630563.)

21523. Igranic Electric Co., Ltd., and Taylor, J. R. Crane hoists driven by alternating current motors. 18th July, 1946. (630313.)

24922. Tumilty, H. G.—Road vehicles driven by electric motors. 15th September, 1947. (630496.)

25493. O'Brien, W. J.—Radio navigational systems. 27th August, 1945. (630435.)

25961. Radio-Industrie and France, H. G. de.—Radio guiding systems especially for the blind landing of aeroplanes. 27th April, 1940. (630314.)

26633. Smith & Sons (England), Ltd., S., and Meredith, F. W.—Electric remote control systems. 4th September, 1946. (630436.)

27982. Sperry Gyroscope Co., Inc.—Radio antenna systems. 18th September, 1945. (630315.)

28156. Amalgamated Wireless (Australasia), Ltd.—Induction heater arrangements. 25th September, 1945. (630316.)

29613. MacDonald, W., and MacDonald, H.—Electrically heated means for the permanent waving of hair. 4th October, 1946. (630440.)

29938. Bolte, L. R.—Thermostatically controlled electric sadirons or similar appliances. 7th October, 1946. (630441.)

30405. General Electric Co., Ltd., and Berry, D. W.—Automatic gain control systems. 11th October, 1946. (630442.)

30470. British Thomson-Houston Co., Ltd.—Linear motion transmitting apparatus. 12th October, 1945. (630443.)

31265. Jestrabek, O.—Electrolytic cell and process of electrolysis. 21st October, 1946. (630568.)

32684. Westinghouse Electric International Co.—Compositions containing polymeric silicones. 20th September, 1944. (630319.)

33291. Philips Lamps, Ltd.—Superheterodyne receivers. 3rd May, 1943. (630321.)

34125. British Thomson-Houston Co., Ltd.—Polysiloxane resins. 21st November, 1945. (630445.)

34664. General Electric Co., Ltd., and Middleton, P.—Manufacture of photo-electric cells. 22nd November, 1946. (630570.)

34702. Sperry Gyroscope Co., Inc.—Cathode structures of electronic-discharge devices. 30th November, 1945. (630324.)

34713. British Thomson-Houston Co., Ltd.—Combined shut-off and metering valve. 24th November, 1945. (630325.)

35065. Machlett Laboratories, Inc.—Electrical-discharge devices. 26th November, 1945. (630571.)

36174. Soc. Industrielle des Procédés Loth.—Impedance-inverting networks. 27th March, 1943. (630327.)

1947

1402. British Thomson-Houston Co., Ltd., and Stanworth, J. E.—Glass composition. 15th January, 1947. (630504.)

1456. Rotax, Ltd., Lucas, S., and Hamilton, R. F. G.—Electric current generating systems. 16th January, 1947. (Cognate application 12323/47.) (630330.)

1510. Walters, T. L.—Electronic telegraph repeater. 16th January, 1947. (630373.)

3208. Cooke-Yarborough, E. H.—Electrical pulse counting arrangements. 3rd February, 1947. (630374.)

5847. Radio Corporation of America.—Plural track sound reproduction. 8th March, 1946. (630581.)

8276. Hawkes, J. L., and Becker, F. J.—Electric switching devices for making up into resilient alarm mats. 26th March, 1947. (630450.)

9019. Telefon Fabrik Automatic Aktieselskabet.—Electrical plug-and-socket arrangements, particularly for use in contact panels in telephone installations. 6th April, 1946. (630333.)

10799. Automatic Telephone & Electric Co., Ltd., Woodland, C. R., and Houghton, E. J.—Automatic pressure-operated valve mechanisms for electric cables. 23rd April, 1947. (630514.)

11501 Fkg F. Kesselring Geratbau Akt.-Ges.—Overload current limiting systems for electric circuits. 29th April, 1946. (630586.)

12256. British Thomson-Houston Co., Ltd., and Boag, J. W.—Electric convertor systems. 6th May, 1947. (630517.)

13430. Wilcox, J. S.—Rotary pumps or motors. 11th June, 1946. (630520.)

13571. Plebanski, J.—Dynamo-electric machines. 20th November, 1946. (630455.)

13952. Belling & Lee, Ltd., and Strafford, F. R. W.—Electrical cable connectors. 23rd May, 1947. (630456.)

16747. Felt & Tarrant Manufacturing Co.—Electric motor or like controller. 23rd February, 1945. (630522.)

17098. Webley & Scott, Ltd., and Smallwood, H. W.—Electrically driven ventilating fans of table, wall and ceiling kind. 28th June, 1947. (Cognate application 16397/48.) (630391.)

18520. British Thomson-Houston Co., Ltd.—Thermally responsive electric circuit-breakers. 11th July, 1946. (630526.)

18551. American Cyanamid Co.—Polarized light

ultra-violet comparison photometers. 1st August, 1946. (630464.)

18827. British Thomson-Houston Co., Ltd.—Electrical temperature measuring apparatus. 16th July, 1946. (630337.)

20992. Western Electric Co., Inc.—Piezo-electric crystal apparatus. 28th March, 1944. (630394.)

21084. Sylvania Electric Products, Inc.—Electric lamp sockets. 13th February, 1943. (630343.)

21364. Erie Resistor Corporation.—Electric condensers and method of making the same. 10th May, 1945. (630344.)

21541. Atkinson, J.—Turbine or like rotors. 7th August, 1947. (Cognate applications 1682/48 and 2043/48.) (630395.)

23032. Soc Française Radio-Electrique.—Multiplex radio stations operating as a network. 20th August, 1946. (630399.)

23091. General Electric Co., Ltd., Curtis, P. B., and King-Brewster, L. M.—Electric sliding contact arrangements. 20th August, 1947. (630347.)

23606. Sangamo Weston, Ltd. — Instrument-type relays. 23rd September, 1946. (630531.)

24336. Lavaud, R. S. de.—Electromagnetic friction clutches. 18th September, 1946. (630532.)

25001. Ainsworth, J. — Electric motor control mechanism for looms for weaving. 12th September, 1947. (630401.)

25278. Standard Telephones & Cables, Ltd., Barnes, A. W., and Skellern, H.—Drum stands for use, for instance, for electrical cables. 16th September, 1947. (630595.)

25493. General Electric Co., Ltd., Curtis, P. B., and King-Brewster, L. M.—Electric inductances. 18th September, 1947. (630353.)

26458. Westinghouse Electric International Co.—Dielectric heating apparatus. 4th October, 1946. (630355.)

26820. Dehn, S. G. (Tyler Fixture Corporation).—Pressure-operated electric switch. 6th October, 1947. (630598.)

26964. Fairweather, H. G. C. (Svenska Turbinfabriks Aktiebolaget Ljungstrom). — Blade rings for radial-flow elastic-fluid machines. 7th October, 1947. (630357.)

26986. Butler, Ltd., H., and Butler, H.—Electrical indicating or measuring instruments. 8th October, 1947. (630404.)

27952. Tench, F. (Automatique Electrique Soc. Anon.—Telephone systems. 2nd November, 1946. (Divided out of 615505.) (630408.)

28573. Winther, M. P.—Universal angle drive, using eddy current couplings. 14th November, 1946. (630535.)

29044. Hudson, C. S.—Magnetic amplifiers. 30th October, 1947. (630536.)

29824. Rawlings, G. W.—Laminated magnetic elements. 26th October, 1938. (Addition to 504800.) (630537.)

30098. Brake, A. H., and Osborne, S. C.—Electronic treatment of liquids for the purpose of reducing the effects of hardness. 12th November, 1947. (Addition to 606154.) (630419.)

30240. Etablissements A. de Backer Soc. Anon.—Stage or theatre lighting installations. 27th December, 1946. (630470.)

30320. Landis & Gyr Soc. Anon.—Top bearing for electrical measuring instruments. 17th December, 1946. (630601.)

31704. General Electric Co., Ltd., and Caldwell, J. T.—Locking means for use with supporting devices. 1st December, 1947. (630476.)

31769. Rushworth, D.—Apparatus for use with portable electrically operated tools. 2nd December, 1947. (630477.)

31934. General Electric Co., Ltd., and Bowtell, J. N.—Circuit-arrangements for operating a plurality of electric-discharge lamps. 3rd December, 1947. (630478.)

32173. British Thomson-Houston Co., Ltd., and Liddiard, H. W. C.—Control of electrically operated winding or like equipment. 5th December, 1947. (630540.)

32188. Graham & Co., Ltd., A., and Vaughan, C. H.—Electric convection heaters. 5th December, 1947. (630479.)

32242. Sims, R. F.—Electric supply systems. 6th December, 1947. (630480.)

32492. Reyrolle & Co., Ltd., A., and Roberts, F. A.—Arc chutes for air-break circuit-breakers. 9th December, 1947. (630482.)

34406. Etablissements Gerard-Mang.—Automatic electric circuit-breakers. 5th April, 1945. (630602.)

34420. Etablissements Gerard-Mang.—Automatic electric circuit-breakers. 8th February, 1946. (Addition to 630602.) (630603.)

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21732/4. Williams, F. C.—Wireless signalling systems. 14th June, 1945. (Divided out of 630367.) (630421/3.)

Amended Specifications

605053. Williams, F. C.—Wireless signalling systems.

607022. British Thomson-Houston Co., Ltd.—Polysiloxane resin enamels.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 26th October:—

BRUSH (design). No. 674,908. Class 7. Starting apparatus for electric motors (other than electric motors for land vehicles), but not including electric contact brushes.—Brush Electrical Engineering Co., Ltd., Loughborough.

WESTLYTE. No. B674,651. Class 9. Illuminated diagram panels being parts of signalling and control systems for use on railway tracks and in electric power supply stations; signals, signs and indicators all illuminated by internal reflection; and parts of and fittings, all included in Class 9.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

KENWELL. No. 677,028. Class 9. Electric switches, electric switch boxes, conduit fittings included in Class 9, and junction boxes.—Small Pressure Die Castings (Bacup), Ltd., Lanehead Works, Bacup, Lancs.

TEDDINGTON AUTOMATIC CONTROLS (design). No. B648,173. Class 9. Thermostatically operated switches and thermostats, all for use in aircraft mechanisms; thermostatically operated apparatus for controlling the temperature of the air flow to the cooling and oil systems of aircraft engines, etc.—Teddington Controls, Ltd., Cefn Coed, near Merthyr Tydfil, South Wales.

CHRODUR. No. 677,722. Class 9. Electrical apparatus and instruments included in Class 9, and scientific apparatus and instruments.—Ingenieursbureau Lemet Chromium H. Van Der Horst, N.V., Hilversum, Holland. Address for service, c/o Neville E. Brookes, 26-27, St. James's Street, London, S.W.1.

MEZ. No. 677,882. Class 11. Electrical apparatus for lighting, heating, cooking, refrigerating and ventilating.—Moravske Elektrotechnicke Zavody Narodni Podnik, Olomouc, Czechoslovakia. Address for service, c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

CELTA. No. 678,173. Class 11. Electric appliances for lighting, heating, cooking, refrigerating, cooling, freezing, drying, ventilating and air conditioning.—Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belfast.—25th November. Electricity Department. Two portable air compressors and one mechanical tower wagon. (See this issue.)

Brazil.—PORTO ALEGRE.—9th January. State Commission for Electric Energy. Hydro-electric power plant at Santa Rosa. (C.R.E. (I.B.) 27419/49. Ten/688.)*

16th January. Sub-station equipment. (C.R.E. (I.B.) 29169/49. Ten/721.)*

Carlisle.—8th November. City Council. Heating appliances for 96 houses. City engineer, 18, Fisher Street.

Deben (Suffolk).—2nd December. R.D.C. Two vertical spindle borehole pumps and electric motors for water supply to eastern area. Pick, Everard, Keay and Gimson, engineers, 6, Millstone Lane, Leicester.

Edinburgh.—2nd December. North of Scotland Hydro-Electric Board. Lighting, heating and auxiliary cable installation at Pitlochry power station. (See this issue.)

Egypt.—CAIRO.—10th December. Electricity & Gas Administration. Electrical stores. (See this issue.)

Newcastle-on-Tyne.—North-Eastern Housing Association. Installation of electricity in twenty-four houses being built at Tow Law, Co. Durham. Mr. J. W. Tibbs, Metrovick House, Northumberland Road, association secretary.

New Zealand.—WELLINGTON.—21st February. State Hydro-Electric Department. 22 kV switchgear. (C.R.E. (I.B.) 29662/49. Ten/739.)*

New Windsor.—26th November. Borough Council. Supply of electric lamps and electrical fittings and cable for nine months to 31st December, 1950. G. S. Baker, borough surveyor, 16, Alma Road, Windsor.

Northampton.—Corporation. Electrical installation at Town Hall. (See this issue.)

Nottingham.—21st November. Corporation. Lighting equipment for trunk road. (See this issue.)

Southampton.—23rd November. Corporation. Electrical installations on housing estates. (28th October.)

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1. Victoria 9040.

Orders Placed

Billingham-on-Tees.—U.D.C. Installation of electricity in 108 houses at Belasis Lane, Billingham (£1,324) and at 190 houses in Cowpen Lane (£2,247).—Haigh & Ringrose. Installation of electric cookers in houses on the Billingham Junction housing site (£23 12s 9d each).—Graham Brothers.

Glasgow.—Highways Committee. Switchgear for use in connection with electric pumps to be installed at Kinning Park pumping station. (£1,569).—M. & C. Switchgear.

London.—L.C.C. Electrical installation at Queen's Crescent School, N.W.5.—Iverson Electrical, Ltd.

Middlesbrough.—Town Council. Electrical installation in aluminium extensions to schools:—Denmark Street School (£940).—North of England Engineering & Electrical Co. Archibald School (£398).—Watson & Coates. Whinney Banks School (£1,002).—Anderson & Son.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—School, Cornhill (£30,250); T. F. Henderson, city surveyor.

Alcester.—Houses (30) for R.D.C.; R. Kemp, Ltd., Kings Heath, Birmingham.

Bridgwater. — Houses (48), Hamp estate; borough engineer.

Bristol. — Factory, Bedminster Trading estate; Bristol Piping Co., Ltd., 75, King Street.

Factory, Cheese Lane; Distillers Co., Ltd., 20/21, St. James's Square, S.W.1.

Burnley.—Houses (130), Brunshaw site; C. V. Thornley, town clerk, Town Hall.

Bury St. Edmunds.—Fire station, Fornham Road; West Suffolk county architect, Westgate Street.

Cardiff.—Factory, Colchester Avenue; Jelly Industries, Ltd., 246, Ballards Lane, London, N.12.

Dairy, &c., Sanatorium Road; Brittons Dairies, Ltd., 84, Beda Road.

Factory, Newport Road; Connies & Meaden, Ltd., Rumney River Bridge Works.

Carshalton.—Flats (84), Clockhouse Farm site, for U.D.C.; surveyor.

Chelmsford.—Re-organzation of water works (£261,000); borough water engineer.

Cheltenham.—Flats, Rowanfield estate (42), and Lynworth Farm estate (61); borough surveyor.

Factory, The Runnings; Douglas Equipment, Ltd., Regent Street.

Coventry.—Houses (323) and flats (130), Tile Hill neighbourhood unit (southern section); Wilson Lovatt & Sons, Ltd., builders, Clarence Street, Wolverhampton.

Darlington. — Houses (29), Middleton St. George, for R.D.C.; Parvin & Son, builders, Bondgate, Darlington.

Dartford.—Houses (58) Temple Hill estate; Hawker-Smith, Ltd., builders, Gravel Hill, Rochester Way, Bexley.

Derby.—Junior and infants' school, Hampshire Road; borough architect.

Dudley.—Junior and infants' school, Buffery Road; Webb & Gray, architects, High Street.

Factory, Flood Street area; Grainger & Smith, Ltd., King Street.

Durham.—Secondary grammar school, Consett; county architect, Court Lane, Durham.

Ealing.—Flats (72) and houses (34), Northolt Grange estate; T. F. Nash (Construction), Ltd., Hayes, Middx.

Eastbourne.—Departmental store, 133/137, Terminus Road; Marks & Spencer, Ltd., 72, Baker St., W.1.

Eccles.—Houses (60), Ellesmere Park estate; borough surveyor.

Gateshead.—Workshop block for new technical college; H. J. Cook, chief architect, Municipal Buildings, Gateshead.

Lincoln.—Houses (20) for Prison Commission; Bernard Pumfrey, Ltd., builders, Lead Road, Gainsborough.

London.—CITY.—Warehouse and offices, Hosier Lane and Smithfield Street; I. Beer & Sons, Ltd., 10, Hosier Lane.

CHELSEA.—Flats (96), West Chelsea; Edward Armstrong & Frederick McManus, architects, 19, Manchester Square, W.1.

SOUTHWARK.—Factory, Tabard Street; Stuart Surridge & Co., Ltd., 210, Borough High Street, S.E.1.

Luton.—Extensions to works; W. J. Harmer, Ltd., Marlborough Iron Works, Archway Road, Leagrave.

Maryport.—Houses (82) for U.D.C.; P. L. Browne, Son & Harding, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

Mill Hill.—Factory building for United Kingdom Optical Co., Ltd., Bittacy Hill; Higgins & Thomerson, architects, 76, Finsbury Pavement, E.C.2.

North Riding.—Additions to the electrical installation at County Hall, Northallerton; county architect, Northallerton.

Oakengates.—Houses (150); M. S. Lee, surveyor to U.D.C.

Oswestry.—Houses (74), Carreglwydd estate; borough surveyor.

Peterborough.—Factory, Fengate; Thomas & Evans, Ltd., Hannah Street, Porth, Glam.

Plymouth.—Factory, Prince Rock estate; Blight & White, Ltd., High Street, Stonehouse.

Port Talbot.—Junior, mixed and infants' schools, and canteen, dining halls, kitchen, etc., in three blocks, Bagland; L. R. Gower, county architect, County Hall, Cardiff.

Rawmarsh.—Houses (70), Monkwood estate, for U.D.C.; J. R. S. Creighton, architect, Parkgate.

Reading.—Factory, Basingstoke Road, Disabled Persons' Employment Corp., Ltd., 25, Buckingham Gate, S.W.1.

Redditch.—Secondary modern school, Bromsgrove Road; R. Y. Logan, director of education, County Education Offices, Castle Street, Worcester.

Rotherham.—Houses (110), Broom Valley estate; E. J. Manson, borough engineer, Municipal Offices.

Rugby.—Houses (194); B. Whitehouse & Sons, Ltd., 247, Monument Road, Birmingham.

Rugeley (Staffs).—Permanent houses (50), Ranton site; E. J. James, surveyor, The Council House.

Salford.—Grammar school, Eccles Old Road (about £300,000); W. C. Young, architect, 195, Oxford Road, Manchester.

Salisbury.—Junior school, Fowlers Hill; Bothams & Brown, architects, 32, Chipper Lane.

Scarborough.—Factory, Seamer Road, for Quartons, Ltd.; Alderson & Allen, architects.

Sheffield.—Three-storey blocks of flats, Manor Park estate and Bradway estate; city architect.

Secondary technical school, Jordansthorpe; city architect.

Southport.—Houses (240), Heathfield Road extension; borough surveyor.

South Shields.—Houses (104), Highfield Road and Bamburgh Grove; borough engineer, Town Hall.

Spennymoor.—Grammar technical school for Durham County E.C.; county architect, Court Lane, Durham.

Staffordshire.—College of further education, Brierley Hill; county architect, Stafford.

Stockton-on-Tees. — Technical college (£199,000); G. Dougill & Sons, builders, Chestnut Street, Darlington.

Houses (200), north of Darlington Lane; borough architect, 28, The Square, Stockton.

Additions to Elton Hall for the Industrial Orthopædic Society; S. W. Milburn & Partners, architects, Esplanade, Sunderland.

Factory, Boathouse Lane estate, for Newton & Newton, constructional engineers, Hunters Lane.

Stourbridge.—Restoration of central library and technical school buildings after fire; A. H. Guest, Ltd., Amblecote.

Houses (72), Norton estate; borough surveyor.

Surbiton.—Flats (72), Mansfield estate; S. Clough, architect, 115, Park Street, W.1.

Swansea.—Extensions to works of British Aluminium Co., Ltd.; A. Monk & Co., Ltd., builders, Padgate, Warrington.

Tipton.—Extensions to works; Wellington Tube Works, Ltd., Great Bridge Street.

Tiverton.—Houses (40), Walronds and Willcombe Lane site; borough surveyor.

Torquay.—Fire station, Teignmouth Road; county architect, 97, Heavitree Road, Exeter.

Watford.—Houses (50), Bushey estate; South Midland & Greater London Housing Society, 30, Fitzroy Square, W.1.

Wednesbury (Staffs).—Houses (90) and 72 bungalows, Hydes Road estate; A. Booth, borough architect, Town Hall.

Wokingham.—Houses (200), Shinfield estate, for R.D.C.; J. H. R. Freeborn, architect, 30, Fitzroy Square, W.1.

Workington.—Factory for Ogden & Lawson, brassfounders; West Cumberland Industrial Development Co., Ltd., Roper Street, Whitehaven.